The Veterinary Record

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

No. 28. JULY 9, 1932. VOL. 12.

THE LUNG WORMS OF DOMESTICATED ANIMALS*

T. W. M. CAMERON, M.A., D.SC., M.R.C.V.S.

LECTURER IN HELMINTHOLOGY IN THE UNIVERSITY OF EDINBURGH AND THE ROYAL (DICK) VETERINARY COLLEGE.

The lungs are a favourite habitat for parasitic worms, both adults and larvæ, and a long and formidable list of the forms found in domestic mammals and birds could easily be drawn up. In this paper, however, it is intended only to consider those which are of economic importance to the practitioner in this country. Accordingly attention will only be paid to the following species:—

Horse: *Dictyocaulus arnfieldi.*

Ox: *D. viviparus* and Hydatid cyst.

Sheep: *D. filaria, Protostrongylus rufescens, Muellerius capillaris,* and Hydatid cyst.

Pig: *Metastrongylus* spp., and *Ascaris lumbricoides* (larvæ).

Dog and Cat: *Ælurostrongylus abstrusus* and Ascarid larvæ.

Fowl: *Syngamus trachea.*

Other species of possible economic importance found in Britain include *Capillaria* and *Crenosoma* in foxes, and *Oslerus* in dogs, but they have not the same general appeal and very little is known about them; further discussion is accordingly omitted.

From the above list it will be seen that while the various species are more or less confined to individual species of hosts, many are closely related both in habitat and in zoological affinities. It will accordingly save unnecessary repetition if they are dealt with in the following order of genera:—

Cestodes: Hydatid cyst.

Nematodes, Ascarids, Metastrongyles (*Ælurostrongylus* and *Muellerius, Protostrongylus, Metastrongylus* and *Dictyocaulus*) and *Syngamus.*

HYDATID CYST.

The hydatid cyst is the larval stage of *Echinococcus granulosus,* the minute tape-worm found in the intestine of dogs, foxes and other carnivores. The egg, passed in the droppings of the fox or dog, is swallowed by the intermediate host—and practically any species of mammal can serve as an intermediate host. In the intestine the larva emerges from the egg and, boring its way through the wall of the intestine, is carried by the blood stream to the liver; if it is not retained by that organ, it passes on to the lungs. There it becomes vesicular, develops externally a strong, laminated cuticle, and internally, a crop of brood capsules, each of which contains a number of small tape-worm heads. Each tape-worm head when eaten by a carnivore is capable of developing into an adult tape-worm. The presence of the cyst in the liver or lungs provokes a pronounced fibrous reaction and an adventitious cyst is formed. In the typical cyst the parasite and the host reaction develop simultaneously and the resulting shape is more or less spherical. When the cyst grows more rapidly than usual and where there is a variable peripheral resistance (due to the presence of bronchi, bile-ducts, blood vessels, and so on) pouches are formed and it is often called a "multilocular cyst." Where, however, the host reaction gains the supremacy, the original cyst becomes broken up into a number of small cysts separated by thick fibrous stromata and is often referred to as multicystic. Other variations are found but all are manifestations of the same parasite; the reaction of the host is the variable factor.

The ideal host for the cyst is the sheep and the lung is as frequently affected as the liver. All three types are encountered in the lungs, the most frequent being the fertile pouched or simple cyst; the multicystic form is rare.

In the ox, the lung is more frequently affected than is the liver; but the commonest form seen is a small, *sterile,* simple cyst, with a poorly developed cyst membrane and adventitia. Larger simple and multilocular cysts, both types being fertile, do occur, but their incidence is low. Multicystic forms usually occur in the liver. In the pig, the lung is less frequently infected than the liver and the simple, unilocular cyst is the commonest form seen. This is also true for horses.

Treatment, of course, is impossible and indeed in this country, symptoms are seldom seen, or at least, noticed and associated with the parasite. Prevention is important, as the domestic herbivores act as reservoirs of infection for dogs and foxes, and so indirectly, for human hydatid. The ox is a poor reservoir owing to the very large percentage of sterile cysts: but the other animals, especially sheep, are important sources of infection. All cysts should be destroyed and dogs should be kept free of tape-worms by periodic dosing.

*Presented to the Dumfries and Galloway Division, N.V.M.A., at Carlisle, on March 31st, 1932.

DEPT. OF VET. MEDICINE

Ascarid Worms.

All the Ascarid worms, whether of man, pig, horse, dog or cat, have a similar life cycle, but it is only in pigs, dogs and cats in this country that the position assumes economic importance.

The thick-shelled egg, passed in the droppings, develops an infective larva in ten days or so, but does not hatch. It is extremely resistant to all adverse conditions, and only heat or repeated applications of one of the phenols have been found to be of any practical use in destroying it. Infection is by swallowing the egg. In the alimentary tract the larva emerges from the egg and bores through the gut wall into the blood stream. It is carried by the blood to the liver, and after a short sojourn there, it passes on, *via* the heart, to the lungs. During this journey, which takes from four to six days, it has increased greatly in size and is too large to pass through the blood capillaries of the lungs. It ruptures them and generally escaping into the alveoli, reaches the bronchi and is mechanically carried up the trachea, to be swallowed. On its second arrival in the intestine it remains there and in a month or so has become sexually mature. Not all the larvæ escape from the lungs, however, and some are carried on by the blood circulation to various other organs of the body.

The damage done by the adult is relatively slight and is generally accidental; but the larvæ can cause the production of serious lesions in the liver, lungs and kidneys.

We are concerned here mainly with the lung lesions, but these cannot be considered without some knowledge of what occurs in other organs.

The larvæ damage the hepatic parenchyma to such an extent that all stages of degeneration from cloudy swelling to actual necrosis are encountered, especially around the intralobular vein. Eosinophiles and mononuclears tend to occur in clusters at the periphery of the lobules as well as scattered throughout the whole tissue. Often this reaction is relatively very slight around the larvæ and it is probably of the nature of a regenerative process. A certain amount of mechanical damage is done, but on the whole it is mainly "toxic."

In the kidneys, the damage is almost entirely "toxic" and affects the cells of the tubules, especially the portion between the loop of Henle and the end of the junctional tubule. Necrotic changes are seen in the cells, and casts and debris are found in the lumina. Larvæ are only occasionally seen in this situation.

In the lungs the actual damage done by the larvæ is considerable and consists essentially of intra-alveolar hæmorrhage and œdema. The blood cells and the alveolar epithelial cells are shed into the alveoli and are phagocytosed by mononuclears which become pigmented. Cell clusters similar to those seen in the liver are less frequent; but larvæ are often found in their midst. While the larvæ do not, it is true, cause a true broncho- or lobar-pneumonia, the traumatic and "toxic" damage renders the lungs highly susceptible to bacterial invasion.

During the stay in the liver there is a definite immunity response to the larvæ which can be demonstrated by complement fixation tests. The host appears to become sensitised by the larvæ during this period and after the first week, when the larvæ migrate to the lungs, there may be an extensive exudative reaction giving rise to pneumonia. There is a proliferation and infiltration of inflammatory cells—mostly histiocytes and eosinophiles—œdema and hæmorrhage; this reaction is mainly localised around the larvæ.

It is true that this question has only been studied in experimental animals and in massive infections; but there is no reason why similar changes, differing in degree, should not take place in our domestic animals.

Whether one or all of these factors operate is not of very great importance; the fact remains that very considerable losses are caused in young pigs and puppies by this parasite. The loss of pigs, in some quarters, is estimated to be as high as 25 per cent. of all animals born. Most of these cases do not come to the attention of the veterinary surgeon, owing to the youth of the pig, and so the seriousness of the position is not generally recognised. The owner generally attributes the death to other causes and says nothing about it. Of the animals which survive, many are emaciated and stunted in growth; chronic lung symptoms are common and maturation is delayed. The animal often dies from some bacterial disease brought on by its enfeebled condition.

The losses attributable to this cause in the United States have been so great that special measures are often adopted to prevent infection with Ascaris. These measures, known collectively as the M'Lean County System, also prevent other filth-borne disease, but, of course, have no effect on swine fever and similar conditions. In essentials, the system consists in keeping the farrowing sow clean and allowing her to farrow in a clean pen; then removing the piglets to an Ascaris-free environment until they are about four months old or 100-lbs. in weight. The sow should be freed as far as possible from Ascaris and cleaned with soap and water just before farrowing—particular attention being paid to the udders. The pens should be well washed out with soda and *hot* water and supplied with clean bedding. The outdoor pens should not have been used by pigs within the past few years, and the pigs should be fed and watered from raised troughs. This system in America has prevented fully half the deaths and increased the rate of growth to such an extent

that the pigs can be marketed two months earlier than before.

Losses among pups could easily be controlled by adopting similar principles; freeing of the bitch from worms before whelping, cleaning her skin and udders before placing in the clean kennel, whelping in an environment carefully disinfected and kept clean, and the rearing of the pups in this or a similar environment until several months old. There is a certain amount of evidence to support the use of cod-liver oil in assisting to prevent Ascaris infection; and its use in any case can do no harm.

We have little positive information as to the importance of this parasite in foals. The equine species, however, follows an exactly similar life history and where common, it must be serious in young animals. Its prevention will follow the same general rules as detailed for the pig form.

Dictyocaulus.

This genus of worms is found in the bronchi of herbivorous animals. The worms are white in colour, with a simple mouth opening. The female genital opening is about the middle of the body; and the male has a typical bursa with two short, stumpy, brown spicules. There are three species of importance:—*D. filaria* of the sheep has a length of about 3 to 8 cm. in the male and 5 to 10 cm. in the female; *D. viviparus*, of the ox, is shorter, the male being only about 4 cm. long and the female 6 to 8 cm.; and *D. arnfieldi*, of the horse, is even smaller, the male measuring under 4 cm. and the female under 6 cm. There are various anatomical differences as well, of course, particularly in the male bursa, which make the specific identification easy. But as there is no authentic case of these species changing their host (among the domestic mammals at least), there is little possibility of a mistake in diagnosis.

The habits and pathogenicity of all the forms is very similar; and as *D. filaria* is best known, its life-cycle, bionomics and control will be considered first.

The adults live in the bronchi, where they pair and the female lays eggs which hatch before they reach the exterior with the droppings. Outside of the body, the larva which has emerged from the egg, moults twice without casting its cuticle, so that the third or infective stage is reached with two enclosing sheaths, the outer of which, however, is soon lost.

This stage may be reached in six or seven days, the exact time depending largely on the temperature. At 27° C., which appears to be the optimum temperature, six days are required, while at 8° C. nine or ten days are necessary. It is interesting to note that the larva remains active at the lower temperature, showing its adaptability to existence in a temperate climate. It can develop and live in mild winters in Britain. The length of its free life depends to some extent on the temperature; it is able to survive for about six months under laboratory conditions, but in practice this period is probably considerably lessened. The free-living larva does not feed, so that, unlike most of its relations from the intestine, it can, and does, develop perfectly in water. It must have some degree of dampness to develop, but once the infective stage is reached, the larva can resist both drying and cooling very well. The eggs and immature larvæ are much less resistant and extreme cold may kill them. The infective larva is unable to penetrate intact skin, and although it does not readily leave water, it will climb on to grass when the humidity is high, retreating as the atmosphere becomes dry again. This migration is greatest during night and dull periods, especially when warm. Direct sunlight causes the larva to retreat to the soil. The most infective period, therefore, is at night or while the dew is on the grass and the weather is warm and humid.

Infection of the sheep is by ingestion of the larva on grass or in water. Once in the intestine, the larva penetrates into the lymphatics of the gut wall, especially the colon, and invades the mesenteric lymphatic glands. Here the larva moults, and young, fourth-stage larvæ, under one millimetre in length, emerge. They pass forwards to the lungs about 10 days after infection and cause small hæmorrhages as they enter the smaller bronchioles. The final moult into the adult stage appears to take place here. Complete development takes about six weeks.

It is interesting to observe that pre-natal infection with this worm can, and does take place; a similar phenomenon probably can take place with other lung worms (including Ascaris). The reason for this is quite obvious from a consideration of the life history.

When numerous, the worms occlude the bronchi and mechanically interfere with breathing. Their presence irritates the bronchial mucosa, giving rise to an inflamed and catarrhal condition, with proliferation of the epithelial cells and the production of fibrous tissue; the inflammation may extend to the adjoining parenchyma, causing a typical peribronchitis. The exudate, consisting of a blood-stained mucus containing exfoliated epithelial cells, eggs, larvæ and many leucocytes, especially eosinophiles and polymorphs, not only assists in the occlusion, but passes backwards to the smaller bronchioles and alveoli. There it causes a localised catarrhal or interstitial pneumonia. In this way, considerable areas of lung may be rendered functionless without the aid of bacteria. Atalectasis may occur as the result of the occlusion of the bronchi or bronchioles by

the exudate, the worms and their larvæ; and a compensatory vesicular emphysema may result. The infective larvæ, if swallowed in numbers, often cause digestive disturbances in penetrating the intestinal mucosa, and diarrhœa may result. Similarly the fourth stage larvæ entering the lungs from the blood capillaries, may cause hæmorrhages and localised areas of inflammation. Neither of these lesions need be considered serious when compared with the effects of the adults and unexpelled eggs and larvæ.

The condition is especially serious in young animals and often terminates fatally. Treatment is still far from satisfactory and best results follow good nursing and careful feeding. Intratracheal injections have had a certain amount of success and the substances injected are legion. Quite good results have followed the use of 20 c.c. of a 1 per cent. solution of Kerol (in animals six months old and above). Chloroform is generally considered to be somewhat unsafe for sheep, but carbon tetrachloride is worthy of a trial—both by insufflation and by mouth. Sheep tolerate it well and it is eliminated by the lungs. It would be of interest to see if clinical improvements in husk districts have followed the use of this drug for liver fluke. Intratracheal injections of this drug are not recommended. Prevention consists in keeping infected animals isolated and putting young sheep on good dry, safe pasture. Drainage, and watering (where this is necessary) from raised troughs are both valuable measures. Keeping animals confined until the dew is off the grass is also useful, where this can be practised.

The larvæ of *D. viviparus* may reach maturity in the open in four days; otherwise all that has been said about the sheep species applies to the cattle species. Calves are especially liable to the infection, and treatment and prevention are on similar lines to those suggested for sheep. Carbon tetrachloride is not so safe for bovines as it is for ovines, but these animals tolerate chloroform much better. Five to 10 c.c. of a solution of pyrethrins in oil (5 milligrams per c.c.) has recently been found by some workers to give excellent results on intratracheal injection.

The life cycle of *D. arnfieldi* is still incompletely known, but it follows similar lines. It differs in having a very short free life, however; a fact which may account for its relative infrequence in equines in this country. Its effects are similar to the others.

METASTRONGYLUS.

There are several species of this genus found in the larger air passages of the lungs of the pig. They are white in colour and the male measures about 1·5 cm. to 2·5 cm. in length, while the female is about twice this size. Unlike *Dictyocaulus* the spicules in the male are long and slender, the bursa is stumpy and the female genital opening is situated near the posterior end of the body. All the species are ovo-viviparous but eggs are not seen in the droppings.

The larva is swallowed by an earth-worm and in it two moults take place, the second taking place very shortly after the first and often within the first cuticle. In a week or so the third or infective stage is reached. Development takes place especially in the heart of the intermediate host. Infection of the pig is by swallowing the earth-worm when the larvæ escape into the lumen of the intestine. In a manner identical to that shown by *Dictyocaulus*, the larva migrates to the lung, which it reaches in the fourth larval stage in five days or so, and reaches maturity in about three to four weeks after infection takes place.

The pathology is similar to that produced by *Dictyocaulus*, but as a rule only very slight symptoms are shown.

Intratracheal injections are not practicable in the pig for technical reasons, and nursing is the only treatment possible.

Prevention consists in keeping animals in styes which cannot become infected with earth-worms, and in the segregation of infected pigs on concrete floors where the droppings cannot be eaten by earth-worms.

PROTOSTRONGYLUS RUFESCENS.

This species is the least common of the three species of lung-worms found in the lungs of sheep in Britain. The adults are reddish in colour and are very thin and hairlike. The male measures about 2·5 cm. and the female 2·5 to 3·5 cm. in length.

The adults live in the smaller bronchioles and cause a capillary bronchitis and a lobular pneumonia. The lesions are very irregularly distributed, and are roughly conical in shape; the cones are much smaller than those sometimes seen in *Dictyocaulus* infections. There is an inflammation of the bronchioles with a catarrhal exudate containing shed epithelial cells and leucocytes. This exudate spreads to the alveoli, the walls of which become thickened by connective tissue and the capillaries congested or obliterated. The epithelium becomes transformed into cubical or columnar shapes and proliferates or is shed. The whole cone may become filled with a dense infiltration of small round cells and lose all resemblance to lung tissue. A fibrous pleurisy may develop at the base of the cone.

Eggs and larvæ are found at the margins of the cone. The larvæ are passed to the exterior with the droppings and can be recognised by the peculiar undulating appendix to their tails. Their subsequent life cycle is unknown.

Nursing is the only treatment known.

MUELLERIUS CAPILLARIS

This is the commonest species of lung-worm found in sheep in many places throughout the world. It is present in practically all adult sheep in Britain. It is smaller than *Protostrongylus* and the male has a spiral tail which is wound round the female during copulation.

This parasite lives in the alveoli or pulmonary parenchyma—especially in the sub-pleural connective tissues, where it forms nodules which may be as large as two centimetres in diameter. It is probable that the adults live for part of their life in the arteries and arterioles, as egg nodules are regularly scattered throughout the lung. The young egg is found surrounded by a mass of leucocytes limited peripherally by epithelioid cells. Outside of this is a thick zone of vesicular tissue consisting of alveoli solidly packed by round cells, and thickened alveolar septa. The nodule containing the adult is much larger and consists in a homogenous or granular material (which may calcify) probably resulting from the toxic degeneration of eosinophils or small round cells. Giant cells may be present at the periphery, which is limited by a few layers of spindle-shaped connective tissue cells. Between the cells, the lung tissue is normal, except for a slight hypertrophy of the muscle fibres.

The eggs hatch in the lungs and the larvæ reach the exterior in the usual way. There they are either swallowed by a snail or penetrate its foot. A very large number of slugs and snails can act as intermediate hosts. The host reaction against the larva is slight and generally ineffective. In the snail two moults occur, the second generally taking place within the cast cuticle of the first. In about 12 days the infective stage is reached and infection of the sheep is by the accidental ingestion of the snail with grass. Development in the sheep follows the same course as in the case of *Dictyocaulus*.

It is doubtful if the parasites cause any symptoms as a rule, although heavy infections must render large tracts of lung tissue functionless and would assist in causing debility and chronic pneumonic symptoms. Treatment by drugs is unknown. It is possible that carbon tetrachloride might be useful in these lung infections, as the drug is eliminated through the lungs; but it has not yet been extensively tried.

ÆLUROSTRONGYLUS ABSTRUSUS.

This is a fairly common parasite of cats in certain parts of Britain. The parasites are small, the female only measuring about one centimetre in length. They live in the pulmonary artery and its branches. The adults appear to do no damage, but the eggs are scattered throughout the lungs, provoking a cellular reaction. Where they lodge in the finer branches of the artery they cause thrombi and a catarrhal reaction in the adjacent alveoli and those served by the vessel which they occlude. The catarrhal exudate is quickly eliminated and the thrombus resolved, so that by the time the egg has developed a larva, no pathological changes remain, beyond a slight thickening of the wall of the arteriole. Toxic changes are absent as the adult does not invade the lung tissue. If the infection is a heavy one, the number of eggs deposited in the lungs, at one time, may be so great that a fatal pneumonia results. This result is really accidental from the point of view of the parasite, as it cuts short the life cycle.

The larvæ leave the egg, pass into the bronchi and so reach the intestine. They are carried to the exterior in the fæces, where they are eaten by mice. They develop to the infective stage in the mouse and the cat is infected by feeding on these mice.

Treatment is symptomatic and prevention is obviously impracticable.

SYNGAMUS TRACHEA.

This species, in addition to being found in turkeys, pheasants, and domestic fowls, has been reported from a large number of wild birds. The adults live in the trachea and bronchi. The male is small and measures only 2 mm. to 6 mm. in length and is permanently attached to the larger female (which measures up to 2 cm. long) to form a "Y." Both sexes have obvious mouth-capsules and are active blood suckers. Accordingly the parasite is bright red in colour.

The female lays eggs which are passed to the exterior with the droppings, where they develop infective larvæ in about a fortnight. They appear to hatch only when the temperature reaches 25° C. Infection is by swallowing the larvæ, or the eggs containing fully developed larvæ along with grit, water or food. In the intestine, the larvæ penetrate the gut wall and reach the lungs in 24 hours, becoming fourth stage larvæ in about five days. These pair after about a week in the lungs and gradually work their way to the larger air passages, growing and moulting as they go. Sexual maturity is reached about 10 days to a fortnight after the trachea is invaded; and the entire parasitic life-cycle may be completed within 17 days. Eggs and larvæ may remain alive in the soil or water for over eight months.

While turkeys can be infected at any age and show scarcely any symptoms, it is important to note that only young chickens are successfully infected as the host reaction in the adult fowl is sufficient to destroy the parasite. Poultry are not efficient reservoirs of the disease as young birds are rapidly killed and old birds do not become infected. "Normal" hosts, such as turkeys and, perhaps, starlings, are much more important.

Symptoms of gapes are produced partly by actual blocking of the air passages by the parasite, and partly by the local inflammatory reaction which results from their presence.

Treatment consists mainly in nursing and the administration of various substances, mainly as powder or vapour, designed to kill the parasite and to expel it by coughing. The intratracheal injection of 1 c.c. of a 5 per cent. solution of sodium salicylate, etc., has been recommended. The instillation of a few drops of pyrethrins in oil is stated to be good.

Prevention is much more important and consists in the segregation of young poultry in runs where they cannot be contaminated by turkeys or wild birds. As earth-worms can carry the eggs *mechanically* to chickens their exclusion from the runs is desirable also.

CONCLUSION

This completes our brief survey of the helminths found in the lungs of domestic animals in Britain. The damage which they do is considerable, but, as in the case of all worms, this damage is, as a rule, directly proportional to the actual numbers present. The lungs have a considerable factor of safety and wide regenerative powers, so that death is much less frequent than is debility and susceptibility to secondary bacterial diseases which often mask the true cause of the illness. The trouble is generally much more important in young animals and so interference with growth is often serious and irretrievable. Treatment is not satisfactory and the best results follow nursing. Prevention is far more important—prevention of disease as well as infection. Good feeding and good housing will always increase resistance, so also will freedom from intestinal parasites. All the helminths we have discussed gain entrance to the body through the mouth and, piercing the alimentary tract, are carried to the lungs by the blood or the lymph stream. Their eggs or larvæ leave the body in the droppings, and after a short period become infective. Each infective stage swallowed results in a single adult only. Prevention must aim, therefore, at reducing contamination of the pasture by the eggs or larvæ, at reducing the numbers swallowed in the food, and at reducing the numbers of adults in the host. How this may be accomplished has been indicated above; but it must be admitted that much intensive research awaits completion before the situation may be regarded as even approaching satisfaction. This research demands the closest co-operation between clinician and laboratory worker—a statement which applies to all the parasitic conditions, not only the lung-inhabiting forms.

Few persons realise just how serious really are the parasitic problems of stock in this country. With the possible exception of cattle, there is no remaining doubt that the greatest single adverse factor influencing animal husbandry is that group of animal parasites which we call helminths. As everyone knows, the parasitic worms are directly responsible for a certain number of actual deaths; but the worms are much more important in causing debility, digestive and respiratory disturbances, retardation of growth, loss of condition, work, meat, wool, and so on, as well as by assisting in the introduction of pathogenic bacteria. The bacterial diseases are often spectacular and epizootic; the helminthic diseases are insidious and enzootic, and therefore, *a priori*, much more dangerous. When we remember that the vast majority of animals harbour some parasites and that agriculture is making conditions even more favourable for their continued existence, it is obvious how very serious the condition must become. Wet summers and mild winters are increasing the danger; and, in the south especially, this spring should show how universal and how destructive these worms can be to domestic animals.

Discussion

Mr. T. W. Hewetson said that he had not found lung infestations of sheep. He had tried several medicinal treatments for lung worms, including carbon tetrachloride, and he would like to know if this was the best treatment for cases with hoose. He found that the trouble was usually very far advanced before the stock owners called them in and though nursing, etc., might be efficacious in the previous stages, some other line of treatment had to be tried if the disease was advanced. He described his method of treatment and gave his prescription and the doses he recommended.

Mr. T. M. Mitchell stated that he had learned quite a lot from the paper and lecture given by Dr. Cameron that day, but that, as far as nomenclature was concerned, he was in a worse haze than ever and Dr. Cameron would forgive him if he referred to the parasites in everyday terms. He would like to know if Dr. Cameron recommended the habit of shepherds of dosing lambs two weeks old as a preventative of hoose. He understood the idea was to clear the alimentary tract from possible invaders. He would mention that he had found a very heavy infestation of strongyles in pigs, but on examination earthworms were very few and he would ask Dr. Cameron what he considered the probable infectivity of the earth worm was.

Mr. Craig Robertson expressed surprise that Mr. Hewetson was not acquainted with hoose in sheep, as he had found it very common in the neighbouring district. He would like to ask Dr. Cameron to give him details of the treatment of this infection.. He had found the paper and the lantern lecture very instructive: they had cleared up many of his difficulties with regard to lung parasites, and he was sure that in the future they would approach the subject with greater confidence and have better results.

Mr. J. R. Rider observed that it was common for old pit ponies at pasture to be losing condition rapidly and he had found intravenous injection of acriflavine very successful. The flotation method for the detection of ascarides had proved unsuccessful in his hands; for

instance, after a case had died for some reason and given negative results for ascarid infection by this method, the *post-mortem* revealed an enormous infe.station by ascarides.

Mr. J. Cameron said that he found that practitioners dosed lambs regularly with the idea of killing the larvæ in the alimentary tract before they reached the lungs.

Mr. T. W. Hewetson remarked that he had found intratracheal injection useless in cases where there was extreme delay in calling for advice.

Mr. F. A. Davidson said that it gave him great pleasure to ask his colleague there that day to lecture to them, as he had no doubt Dr. Cameron was in the forefront as far as Veterinary Parasitology was concerned. He was disappointed that certain practitioners had not so far taken part in the discussion, as he knew that one of the biggest bugbears of the practitioners in that area was infestations of parasites, especially lung worms. This was based on his knowledge of the very poor drainage that existed all along the Solway shore and in huge tracts of sheep land in the hills of Dumfries. Also from his observations in slaughter-houses he knew that there was bound to be a large number of cases, reported to veterinary surgeons, which were either primary cases of parasitosis or complicated by this. From observations of geographical conditions, he was not surprised that Mr. Hewetson did not find hoose in sheep in his district and that Mr. Robertson did find it in the neighbouring one, as the drainage in the former's district would be very good, whereas in that of the latter it was practically nil. There was no doubt that in parasitic infestation it was essential for the successful tackling of the outbreaks, which here were more than endemical, that the practitioners should know the life history of the various parasites. No doubt many infestations could be treated successfully by drugs, but prevention was the ideal to be aimed at and that should be achieved by the veterinary practitioner; he could only do this, however, if he studied the subject in all its aspects. Repeatedly he had cases reported to him under the Tuberculosis Order, which he ascertained to be hoose or some other trouble, and he found it comparatively easy to convince the farmer that the outbreak could be tackled successfully: he usually managed to persuade them to call in the practitioner.

Mr. A. Young agreed with Mr. Davidson's remarks *re* drainage and gave details of his experience of treatment with regard to the volatile drugs.

Mr. T. M. Mitchell asked how long a field remained infected after a heavy infestation.

THE REPLY

Dr Cameron, in replying briefly to the various points raised, commented on the question of nomenclature raised by Mr. Mitchell. Scientific nomenclature during the past decade had undergone many changes. Old terms had given place to still older and often forgotten names; new species had increased and old species had been broken up. The result was that the practitioner was almost lost in a sea of unrecognised names. Fortunately a state of stability had now been reached and the veterinary surgeon of the future would sail on well-charted waters. Meanwhile the scientific name, it was well to remember, was intended to connote a special animal. For general use group names, such as Sclerostomes, Cylicostomes, hookworms, lungworms, and so on were often sufficiently descriptive for clinical purposes and there was no possible objection to their use under these circumstances. So long as it was obvious what was being discussed, the name was immaterial. The husk worm of calves was just as accurate and just as descriptive as *Dictyocaulus viviparus*.

[The paper circulated to the members previous to the meeting was only a synopsis and the complete discussion and reply have not been given, as Dr. Cameron has dealt with the majority of the points raised in his full paper now published.]

THE PATHOLOGY OF REPRODUCTION IN DOMESTIC ANIMALS*

W. L. WILLIAMS
Ithaca, New York

(Professor Emeritus; formerly Professor of Obstetrics and Research Professor in the Diseases of Breeding Cattle in the New York State Veterinary College at Cornell University.)

LECTURE No. III.

The Nutritive Supply and the Breeding Power

THE INFLUENCE OF THE FOOD SUPPLY UPON BREEDING AGE

If an immature female conceives she must first maintain her physical life and continue in a measure her growth, before she can safely undertake the burden of efficient nourishment of her intrauterine young. If a dairy heifer is bred at 15 months, when perhaps less than half the size of her dam, she immediately faces the triple load of her own growth, the maintenance of her life and the life and growth of her intrauterine young. The load is not vacated at birth. Profound changes have occurred in her uterus during pregnancy. If she is to retain her sexual health her uterus and other genital organs must be promptly restored to the prepregnant state. In nature she must secrete sufficient milk for the needs of her calf; in dairying she is asked to yield a profitable milk supply. Fatigued from the burden of pregnancy while immature, her energies taxed to capacity in the repairs after calving and in heavy lactation, she is not infrequently rebred within 40 to 60 days—although still immature, and in the natural state not yet ready to conceive for the first time. She then commonly falters if she has not previously experienced disaster. Her milk yield diminishes abruptly and her second pregnancy is menaced.

At the opposite extreme is the observation of du Toit that the native cattle of Algeria, accus-

*A series of addresses delivered before the Veterinary Short Course at the Alabama Polytechnic Institute, Auburn, Alabama, February 1st to 6th, 1932. Reproduced by courtesy of the author and of the Editor of *Veterinary Medicine*, in which periodical simultaneous publication is being given to these lectures.

tomed to a very poor veld, commonly first calve at about seven years. The gradations between these extremes are created through artificial selection and the food supply. Common heifers living upon an ordinary range, where the forage is at no time abundant and at some seasons definitely scarce, commonly ovulate and first come in œstrum at two years, while the artificially selected and highly-fed dairy heifers are commonly in heat at six months. The five dairy heifers mentioned on page 758 (*V.R.*, July 2nd) which ignored artificial and natural exposure to Bang's bacillus, had been grown slowly. When about two years old, and it was desired to breed them preparatory to inoculation, it was discovered they were not coming in heat and hence could not be bred. They were being fed sparingly upon timothy hay of indifferent quality. The addition of a light grain ration promptly overcame the difficulty and conception ensued. The heifers had not been starving upon the hay ration, but there was no surplus energy upon which to undertake reproduction.

Both growth and ovulation are advanced greatly in highly-bred and highly-fed dairy calves; the ovulation apparently outruns physical development. The dairyman is naturally desirous to place his heifers upon a profitable basis as early as possible. He is supported in this by prominent and able investigators, who present data indicating that a heifer may be safely and profitably bred to calve at two years. The researches commonly involve but a short period, and do not follow the animals to the close of breeding life. In this way a good showing may be made, although completeness of the investigation may well be challenged. The belief has become current that unless heifers are bred early, they tend to become sterile or to conceive with difficulty and are poor milkers. The assumption is apparently based upon a confusion of facts. If a heifer conceives with difficulty, and only after several breedings, whether first bred at 12, 24 or 36 months, it is not probable that she will become a valuable dairy cow. Her career is blighted because she was sexually unsound when first served. It has not been clearly shown that a sexually healthy heifer is seriously damaged by holding her out of breeding until 24 to 30 months of age.

The 17 heifers constituting Group A in Table III, page 755 (*V.R.*, July 2nd), were unusually uniform in pedigree, type, health and vigour. The terminations of their first pregnancies ranged between 1·96 and 3·12 years. Two had passed three years at first calving. Both are living and are 14·3 and 14·2 years old respectively. One has produced 11 viable calves, the highest in the group, the other is one of three which have produced 10 viable calves each. Eight heifers calved at less than 2·25 years and have averaged 7·75 calves each. Nine had passed 2·25 years at first calving and have averaged 8·44 calves each. In the early-calving group, 32·5 per cent. survive; in the late group 55·5 per cent., a superiority of 7 per cent. The ratio of aborts and non-viable calves in the younger group is 7·5 as compared with 3·8 per cent. in the older. The records show that three heifers required more than one service for conception. The delay caused all three to pass from the younger into the older group; that is, had they conceived at first service they would have been in the younger group. If they be shifted to the younger group, important changes occur in the computation. The number of viable calves per cow in the younger group drops to 7·73 and advances in the older group to 8·83. In the younger group the mortality in 63·6 per cent., in the older 33·3 per cent. The aborts and non-viable calves advance in the younger group to 8·2 per cent. and recede in the older to 1·9 per cent. As measured by the production of viable calves, by the ratio of abortions and non-viable calves, and by the longevity of the cows, the superiority of those heifers bred to calve after 2·25 years is definite and authentic. The heifers of the entire group had been well fed and were healthy throughout their lives, so that for their ages they all were well developed. The inferior showing of the younger portion cannot be attributed to want of maturity for their age, but must be regarded as strong evidence that in highly vigorous and well grown heifers, breeding them to first calve at less than 2·25 years of age proved injurious and uneconomical. Extensive data in this field are not available. Careful study of this little group of 17 indicates that the optimum data for heifers of their type to first calve, whether considered from the immediate economy of dairying, or from the standpoint of the upbuilding of the dairy and the breed, is not far from three years.

Abortion is the most commonly accepted standard for measuring the intensity of sexual pathology in domestic animals. In dairy cattle, where genital disease is the most destructive, it is by far most prevalent in first pregnancy. When discussing the influence of the health of the young calf it was held that if a heifer calf were unhealthy during its milk-feeding period, its first pregnancy would be seriously endangered thereby, and that the fertility and longevity of the animal would be lowered. The foregoing studies of Group A bring into view the further highly important element of the age at which the heifer is first bred. This factor presumably acts alike upon heifers whether healthy or diseased during the milk-feeding period. The principle apparently applies alike to all domestic animals. In most species of domestic mammals nature bars premature con-

ception through non-ovulation until the young animal is well matured. The two notable exceptions are horses and cattle, in which artificial selection, warm housing in winter and abundant food have served to nullify nature's law in certain breeds and families and cause ovulation to occur far in advance of maturity. A client inadvertently permitted a group of yearling Percheron fillies to become pregnant; all aborted at less than two years of age. I attended several of them because of the complication of dystocia. Accidental conception in dairy heifers at five to eight months occurs now and then and is commonly tantamount to ruin.

While abortion and other pathological phenomena of reproduction are conspicuously most prevalent in first pregnancy in dairy heifers, this rule is vacated when heifer calves are healthfully grown and not bred while too immature. This is well illustrated by the eight aborts and non-viable calves in the 17 heifers. Their distribution according to the number of pregnancy was as follows:—

Second pregnancy	...	...	1
Sixth pregnancy	...	...	1
Seventh pregnancy	...	...	1
Eighth pregnancy	...	...	2
Ninth pregnancy	...	...	3

Seven animals were involved, one having aborted the eighth and ninth pregnancies. While droughts and other factors have played a part, the decreasing energy of old age is clearly the most important. The entire group has been heavily bred. Many of the cows repeatedly bore two calves at less intervals that 365 days, sometimes at little more than 300 days. They stood the strain well, but at last began to falter.

Observations by McCampbell indicate that range Hereford heifers, without having had a substantial grain ration and bred to calve at two years, are seriously damaged. The calf crop was 30 per cent. below that of three-year-olds and 30 per cent. of the heifers only became non-breeders.

The influence of nutrition begins with the fertilised egg and ends only with the close of reproductive life. The nutrition may be defective in various ways. Sometimes there occurs a definite malnutrition, in which nutritive elements may be present in sufficient amount but the food is contaminated with injurious substances or is given to the animal under such conditions that the food elements reach the tissues associated with dangerous materials. In the endometritis of pregnancy, so prevalent in dairy cows, the nutritive elements which reach the gravid uterus through the uterine arteries may largely fail to pass the barrier of disease in the placenta and that which does pass inevitably carries contaminating elements from the diseased tissues. The effects of these are abundantly registered in the frequent fœtal diarrhœa in diseased dairy cows, the meconium being clearly recognisable in the amniotic fluid. The disease disturbs development, causes abortion and premature birth, and the latter leaves in its wake a weakness which imperils future breeding health.

In the herd comprised in Tables III and IV the cattle are primarily and almost wholly dependent upon forage. The ranch is not stocked to capacity; an abundant reserve of forage is assured always. When droughts come, the most succulent and protein-rich forage, like blue grass, the clovers and vetches, etc., disappear and Bermuda grass takes precedence. It becomes dry and woody, but there are no material indications of decomposition. It is apparently good forage, at least as measured by the condition of animals not burdened by breeding or old age; they are fat and show every sign of excellent nutrition. But pregnant cows, cows in milk and aged animals show the strain. Apparently the woody forage is too difficult of digestion to enable the handicapped animal to maintain adequate nutrition. Hence periods of drought are marked by depressions in the rate of reproduction, with abortion as one of the phenomena. The abortion climax comes at the end of the drought when cold rains borne on strong winds chill the pregnant animals already depressed by the dependence upon forage of low nutritive value. As soon as the rains have produced abundant succulent forage the abortions disappear, the conception rate advances and the milk yield increases. These forces are seen less clearly in dairy cattle of the temperate zone, regularly stabled in winter. Their fertility declines as winter advances, but when spring comes and cows and heifers, long sterile, have access to succulent grass, the fertility rises.

Famine is inseparably linked with pestilence. In most agricultural districts with reliable rainfall, famine is a stranger. In the great cattle ranges of the western United States, where cattlemen habitually stock the ranges to capacity in years when rainfall is normal, the cattle are brought face to face with famine when drought comes, and there is nothing more certain in a range country than occasional drought. Then pestilence follows. There are always sufficient forms of bacteria or other types of parasitic life to create havoc when animals are depressed greatly by famine. There is no need for the importation of contagion from without. The pestilence cannot be stayed by isolation, quarantine, vaccination or medication. A few years ago severe drought brought famine in an extensive range area on the Pacific coast. An acquaintance went into this area and purchased cheaply eight hundred Hereford heifers; had the seller breed them, and then shipped them to a range with ample forage. The 800 heifers produced 35 calves! Parts of Montana have

suffered severely for two or three years from drought. The cattlemen had stocked the range to the limit of its capacity under normal precipitation. What forage existed at the beginning of the drought was good. It is not a question of damaged food but one of the absence of forage. The common cattlemen have no store of cured or preserved foods and no funds with which to import food. Abortion became rather conspicuous early in the drought and there was talk of the application of the agglutination test in order to determine if the offender were Bang's bacillus. But as the drought continued abortion in the starving cattle became so common that each owner was made fully aware that his herd was aborting abundantly and he ceased to worry about getting contagious abortion from his neighbour. My informant, a progressive breeder of pure-bred Herefords, had sufficient food of good quality in store; he does not dread the introduction of abortion from his neighbours so long as his food lasts. It may aptly be termed "famine abortion." Many adult animals are dying of want and with the prevailing abortion the numbers of cattle in the area will become reduced to the capacity of the range and, when rains come, they will breed and thrive for a while, until the cattlemen again heavily stock the range and the next famine arrives. This is, of course, a provision of nature for the perpetuation of the species. If the dam's life were sacrificed for the young it too would succumb. If by sacrificing the young the dam's life can be saved she can continue the species when the famine is passed. The faculty is inherent and without it the species probably would not have survived the long series of famines that must have occurred in its history and would be numbered among the extinct species of bygone ages.

THE REST INTERVAL BETWEEN PREGNANCIES

The interval elapsing between the close of a pregnancy and the resumption of ovulation varies widely according to species. The mare is regularly in œstrum at six to ten days, most commonly on the ninth, post-partum. In the cow the corpus luteum is regularly present at calving time and she does not ovulate until the body is atrophied, a function which is profoundly affected by the health of the genital system. It has been noted previously that the occurrence of ovulation and heat have been changed profoundly in horses and cattle through artificial selection, food and housing, and that as a rule heifers and fillies ovulate and come in heat long before they have reached a stage of development consistent with safe pregnancy and birth. In these two species also œstrum occurs in a large proportion of females after an interval following the termination of pregnancy insufficient to permit the reproductive system fully to recover its pre-pregnant state. Little accurate study has been devoted to the question of how long a puerperal mare or cow had best be held out of breeding on behalf of her sexual health. It is decided largely by tradition.

Practically all horse breeders and writers upon horse breeding are unanimous in the belief that a mare should be bred upon the ninth day after foaling. Little evidence is available in support of this view. The very limited data I have been able to secure upon this point indicates that a mare which conceives on the ninth day is three to four times as liable to abort as a mare bred at a later date. There is confusion here because most mares not bred on the ninth day are held back because of obvious genital disease. According to my observations, in a thoroughbred stud in which genital disease was high, most mares showed definite endometritis on the ninth day with profuse genital discharge associated with diarrhœa of the foal. Healthy mares largely conceive if bred on the ninth day, but when breeding is forced, and famous stallions are heavily used, the mares largely become unsound genitally. According to my observations such mares conceive more readily and the pregnancy is safer if bred at the second œstrum.

Von Oettingen observes that thoroughbred foals born at 320 days or less have an excellent prospect for developing into valuable animals, while those carried over 345 days are almost never highly efficient. According to my observations foals carried 365 days or over are only rarely viable, although commonly alive when expelled. It is fairly safe to assume that careful observation would show that prolonged gestation, like abortion, occurs in a far higher ratio in mares conceiving on the ninth day, in spite of the fact that it is only the healthiest mares that become pregnant at the first heat.

Under the influence of tradition the horse-breeder raises two, apparently formidable, objections to not breeding the mare on the ninth day. He believes that the mare does not promptly come in œstrum again and that when she does so she does not so readily conceive. The belief is apparently based upon the behaviour of those mares so shockingly diseased at the ninth day as to make breeding unthinkable. Badly diseased mares are not regularly in œstrum and do not readily conceive. The other objection is that if the second œstrum is awaited the mare will not again foal within a calendar year. The ground is poorly taken. Some of the most severely diseased mares which retain a measure of power to breed regularly carry their foals beyond 365 days and thus exclude all possibility of again foaling within a calendar year. Conception on the ninth day, before the genital system has recovered from the prior gestation,

may very well lead to later foaling than had the mare been held out of breeding until the 30th day and full recovery been permitted. The law would then be that the uterus being healthier, the development of the fœtus is more rapid, the gestation shorter, the foal larger and more vigorous and the mare has borne the load with less injury.

In dairy cows, where metritis and retained afterbirth are so common in their milder forms that they are largely regarded as normal, involution of the uterus is retarded greatly; the duration of time required for a complete restoration of the genital system to the physiological pre-pregnant state is much prolonged. The cows depicted in Table III had suffered generally and severely from metritis. With a view to an improvement of the breeding health, it was decided in 1930 to allow each cow a sexual rest of at least six months, after the termination of a pregnancy, before again breeding her. The environment was such that accidents and errors occurred and a few cows were bred without the rest interval planned. In 1931, five of these, constituting the majority of the group, were recorded as having aborted; no abortions were recorded amongst the cows to which the rule had been applied. The incident sounds fantastic but to me it possesses two attractive virtues: it is in full accord with the principle that the genital organs should have recovered their equilibrium from one pregnancy before commencing another, and it is in perfect harmony with such other observations as I have been able to make in this field. In the end, also, there were more and better calves and more milk.

There is no logical reason for expecting that conception occurring in a diseased uterus will end in the physiological production of young. Although the injuries may have been severe there is still reasonable hope that the animal may breed acceptably if ample time is allowed for the completion of repairs before again becoming pregnant. Some cows breed fairly well after the endometrium has been completely destroyed in one horn, if the other horn is reasonably healthy, but the smaller area must carry a correspondingly heavy load and pregnancy cannot be so secure.

The added burden of heavy lactation in the dairy cow depresses her vigour and delays the involution of the uterus. Dairymen largely ignore this; frequently breeding the cow after an interval of 30 to 40 days and imposing an additional load when she is already faltering.

Twin conception throws an interesting light upon the problem. Twin conception in mares and cows generally follows a long period of sterility or occurs very shortly after the termination of a previous pregnancy before the reproductive system has regained its physiological equilibrium. Thus, in a highly sterile thoroughbred stud, after effective measures had been applied to advance the rate of conception, 26 pregnancies comprised six pairs of twins. If twin gestation is commonly preceded and followed by sterility as indicated in Table I, page 754 (*V.R.*, July 2nd), or is closely associated with low fertility as shown in Table III, page 755, it logically follows that twin conception should occur frequently when the animal is bred too early after the close of the previous gestation. The reproductive system is in a disturbed state, which may lead to the discharge of two ova in a uniparous animal. That being true it naturally follows that twin pregnancy is unsafe, abortion common, premature birth general in those not aborted and the outcome usually highly unsatisfactory.

Writers frequently mention " twin abortion " as a phenomenon apart from " contagious abortion." Their meaning is not clear. Evidently the two fœtuses constitute an extra load upon the uniparous female, but that provides no explanation of why a uniparous female should break her law of reproduction by discharging simultaneously two fertilisable ova. The cause needs be sought in some genital disturbance which has affected the equilibrium of the ovaries. Sometimes this loss of equilibrium becomes very striking. Thus McIntosh cites the example of a cow which aborted 10 fœtuses within 20 months. There were two sets of triplets and two pairs of twins. The abortions are stated to have occurred at three to four months. Apparently there were intervals of not over 90 days between one abortion and the next multiple conception; an inadequate period of time for complete recovery from the previous disaster. The instance is reminiscent of a diseased fruit tree which blooms extravagantly when incapable of producing any fruit.

Twins are mostly males. The causes of an excessive ratio of males in twins apparently also operate in singles, with the result that sex parity is disturbed by genital disease with an apparent tendency toward an excess of males. In a healthy Hereford herd the ratio of bulls to heifers, amongst 94,436 calves at branding time, was 102·3 : 100. On the same ranch, separated by a wire fence, 873 grade Holstein calves showed a ratio of 119 : 100. In the pure-bred Holstein herd, also separated by a wire fence, the healthy heifers of Group A in Table III showed in their first pregnancy a ratio of 70 : 100, compared with a ratio of first calves in Group B of the same table 209 : 100. For the entire herd there is record of 62 aborts and non-viable calves with a sex ratio of 210 : 100. The data at hand indicate that amongst sexually healthy cattle which are not bred too rapidly the dairyman may confidently rely upon sex parity of his calves.

THE COMPUTATION OF BREEDING EFFICIENCY

The method of computing breeding efficiency has always been incomplete and vague. The ideal commonly expressed is that each mare and cow should annually give birth to one healthy offspring. Categorical statements occur of dairy herds which attain this ideal. It would be more intelligible if the facts were submitted instead; the fallacy of the categorical statements would then become apparent. There is the statement, for example, that in a purebred dairy herd consisting of 250 cows, each produced one calf annually for ten years. I have published a chart showing that a cow breeding so ideally and her female progeny being equally fertile, would have at the end of ten years, 27 female progeny, or for the 250 cows there would be an increase of 6,750 females. No record is submitted to indicate what became of any of them. It is easy so to manipulate statistics as to show that a common herd has averaged one calf per cow for a given year. Sometimes the "calf" is a dead fœtus. It is not scientifically nor economically a calf but is merely a statistical calf. Some writers list a first pregnancy heifer as having "calved normally" and promptly died from retained afterbirth. Statistically she made a perfect score but economically she was a total loss.

The complete record of a cow should include her entire life from the day of her birth to that of her death inclusive. With the complete record of milk production and the total viable calves borne a true valuation may be computed. Thus the great Holstein, Glista Ernestine, lived 5,871 days and produced 13 living calves or one calf for each 451·6 days. She yielded for each day of her life 34·4-lbs. milk and 1·6-lbs. butter.

There are many researches upon the cost of maintaining calves but no complete data concerning the actual value of the calf after it was raised. The authors do not state how many fail to breed or the ratio which abort their first pregnancy. The question of how to raise a dairy calf to insure its maximum efficiency as an adult has not yet received much attention.

The dairyman cannot simultaneously have his cow produce the maximum number of calves and the maximum volume of milk. If bred too early after the close of the previous pregnancy the milk yield becomes depressed. The breeder of registered dairy cattle recognises this principle when desiring to make long time records of milk and butter fat. He dries the cow off early and with heavy feeding endeavours to have her accumulate a maximum store of energy which may be drawn upon after calving. In addition he withholds the cow from breeding for an extra long period so that her energies may go wholly to milk production instead of sharing with the nutrition of the fœtus. He sacrifices rapidity of calf production in favour of more profuse lactation. In Group A, Table III, page 755, the eight animals which first calved at less than 2·25 years produced during life, or if still living, up to May 31st, 1930, a daily average of 17·3-lbs. compared with 15·55-lbs. for the nine animals calving first after 2·25 years. Various factors came into play and the influence of each is difficult to compute accurately. Many would attribute the difference to the influence of early breeding. An imperfect study of the records makes that doubtful. The group first calving after 2·25 years has produced more calves and at shorter intervals, which inevitably reduces the rate of lactation. The computation must remain incomplete while some of the animals continue breeding and milking. The heaviest milk yield generally was in the first and second years, before the strength of the animals of the entire group had been depressed by rapid breeding. A higher ratio of the group first calving after 2·25 years remain in the herd and may modify greatly the average milk yield per day. Naturally the average total milk per cow is greater in the group first calving after 2·25 years.

Following conception there was regularly a drop of at least 15 per cent. in the milk yield except at the close of a period of drought when a sudden plenty of succulent forage reversed the order. The shorter the interval between calving and the resumption of pregnancy apparently the greater the decline. Thus heifer V, bred 62 days after her first calving, at the close of a protracted drought and after a rainfall of 3·10 inches, advanced 70 pounds the next month. Following the second calf she was re-bred at 61 days and promptly dropped from 2,230 pounds to 1,957 pounds the next month in spite of a precipitation in the two preceding months of 12·39 inches. The strain of rapid breeding and lactation were becoming apparent. Her third pregnancy dropped to 276 days, which should have served as a caution signal, but she was again bred at 39 days (30 days after she should have calved), twin conception followed with a pregnancy of 275 days. She then definitely staggered under the burden (probably had retained afterbirth), and was not re-bred for 109 days. She failed, failed again 20 days later and conceived after a further delay of 20 days, and calved at 278 days, 7 days short of the ideal. Re-bred 77 days later she calved at 282 days and was thereafter sterile. When breeding records are carefully studied, cow after cow will be found which vividly illustrates the principle that sexual overloading always menaces the breeding life of the individual.

If healthy, vigorous calves are to be produced —without which profitable dairying is impossible—the dual load of pregnancy and lactation must be kept well within the strength of the

cow. A ton truck will probably carry a two ton load—for a while—but will soon be damaged beyond repair. A careful study of the herd illustrated in Table III seems to indicate that the dairy, as well as the beef heifer should not be bred to calve long before three years of age, and that the rest period between calving and again becoming pregnant should on no account fall below 80 days for a vigorous cow in the prime of life. Placing the normal duration of pregnancy at 285 days this allows an interval of 365 days between calves. The age and health of the animal should be considered carefully. The prevalence of abortion, retained afterbirth and other pathological phenomena of reproduction in dairy heifers bred to calve before three years indicates that the load has been too heavy for their strength; that it would be prudent, for the sexual health and longevity, that a long period of rest, perhaps five to six months, be granted after the termination of the first, before beginning the second pregnancy. After the second calving the rest interval may be reduced. As old age comes on the rapidity of breeding should be checked again and an effort made so to adjust the burden that it may not only be safely borne, under anticipated conditions, but that there shall be held in reserve a liberal degree of strength as a protection against unforeseen stresses. The rest interval between two pregnancies should be modified constantly, according to the health of the animal. If a heifer or cow calves at 245 days and is re-bred 40 days later she will have become pregnant again on the day when she should have calved. When a cow calves at 275 days or less it constitutes a danger signal which the prudent breeder should heed, and apply as the greatest assurance against disaster a very liberal rest interval before the next conception.

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The Veterinary Record

July 9th, 1932.

PARASITOLOGY.

PARASITES, like the weeds in the fields, are always with us. They always have been present in or on our animals, but in the past only the grosser forms have attracted notice. Even these, however, have been objects of interest and amusement rather than causes of disease and loss, in the eyes of the ordinary farmer. Some have attracted the attention of the statesman with not unimportant results. Measles in pork are the primary cause of the enactment of the earlier meat inspection regulations and the Trichina worm was the main stimulus to the creation of an important Bureau of Animal Industry in the United States. Fluke and the grosser tape-worms and round-worms have, it is true, appealed to the farmer as possible sources of loss but until recently little has been done to prevent this loss.

Since the war, however, parasitology has come into its own. This has been recognised by the Royal College of Veterinary Surgeons by the establishment of a new and separate table of Parasitology in their Diploma Examination. It has been recognised by statesmen, and parasitological institutes have been formed in most of the important countries of the world. In Britain, the work of the Institute of Agricultural Parasitology, under the direction of Professor Leiper—one of our most distinguished Honorary members—is well known and appreciated. In the Dominions, Onderstepoort in South Africa, and the MacMaster Institute in Australia, are largely investigating parasitic diseases of animals, while in Canada, the new Institute of Animal Parasitology at Macdonald College, M'Gill University, will extend and continue this work for the temperate regions. Many individual workers are experimenting and investigating in the field and some have already made discoveries of first-rate importance. The subject cannot be confined to the laboratory worker and the professional parasitologist, however; and the practitioner must play an immensely important part in the development of the science. Without clinical research, any medico-veterinary subject must remain sterile and fruitless. We must know what an animal does, how it does it, and why it does it, before we can evolve steps to prevent its doing it. It is in the elucidation of these

questions of why and wherefore that the services of the general practitioner prove invaluable. In these columns in recent days observations on the effects of certain anthelmintic drugs have been recorded by various veterinary surgeons; and extensions of these observations will make the results of the laboratory of more immediate practical use. Elsewhere in this issue we publish a paper on the lungworms of stock animals and readers will see in it other opportunities which they may seize whereby science may be enriched and knowledge advanced. This is only one branch of the subject; there are many more, even more important. The intestinal worms of sheep, the sclerostomes of horses, the round-worms of pigs and others will occur to everyone. There is a large accumulation of scientific data about them all; but there is a great lack of accurate clinical observation on their results and their treatment. Every practitioner meets parasites daily and from his experience evolves definite ideas on the part they play in veterinary medicine. With the new teaching every future practitioner will have a new array of facts to apply, but these he can only quickly learn to apply with the assistance of the man who has learned how to recognise and fight parasites in the field of clinical medicine. We hope that we do not appeal in vain for the help that it is the duty of every clinician to supply.

DOGS IN MOTOR CARS

Successful A.A. Appeal

The Automobile Association has just successfully appealed to the High Court on behalf of a member whose dog, whilst left in a motor car, had bitten a child.

The parents of the child had brought an action for compensation, but the Jury were unable to agree. In taking the matter to the Appeal Court, the A.A. asked for judgment to be entered for the motorist, mainly on the grounds that there was no evidence that the animal was dangerous, and consequently the motorist was entitled to leave the dog in the car.

Lord Justice Scrutton, in giving judgment, said that dogs generally were not in the class of ferocious animals, and therefore the owner of the dog was not responsible unless the animal was actually known to have acquired vicious habits of which the owner was aware.

The decision in favour of the A.A. member virtually means that motorists can keep dogs, not known to be of a dangerous nature, in their cars without incurring liability should the animal injure a person who may trespass upon or tamper with the vehicle.

* * * * *

During 1931 the Island of Guernsey spent £234 in connection with the treatment of cattle diseases, and £142 on the destruction of carcasses. Only £5 10s. of the amount was spent on the eradication of bovine tuberculosis.

Clinical Communications

DIAPHRAGMATIC HERNIA IN THE DOG

R. H. SMYTHE, M.R.C.V.S.
Camborne

Although this condition is by no means rare, the following case presents several unusual features.

The subject was a black and white cross-bred Pom. dog, thirty pounds weight, six years old, the property of a farmer, resident in town about two miles from his farm. The dog was employed to carry messages, secured in a pouch attached to his collar, from house to farm and *vice-versa*. He invariably ran two trips daily and unlike two-legged messengers, never dawdled on the way.

On July 27th, 1931, he was knocked down by a heavy touring car, the wheels passing over his abdomen.

During the next twenty-four hours the dog vomited several times and appeared a little stiff in movement, but after two days' vacation he again commenced his journeys and appeared to have recovered completely.

The dog being naturally a shaggy creature, his owner was surprised to find that by a fortnight later the animal had cast his coat and was perfectly bald. However, new hair appeared and grew very rapidly and by the beginning of September the coat was again fairly thick.

On February 18th, 1932, I was called in to see the dog as he appeared to have some difficulty in breathing and was behaving in a peculiar manner, being apparently afraid to lie down although he frequently attempted to do so. He had been out with the children for a walk on the preceding day, had galloped after a ball and indulged in his customary frolics.

His respirations were normal in frequency but exaggerated, as in emphysema. There was dulness in the lower half of the chest, but increased sound in the bronchial region. The most noticeable feature was the apparent emptiness of the abdomen on palpation; the fingers could be made to meet in any portion of the belly with merely skin intervening. The prepuce was œdematous.

The dog was apparently unable to lie at full length and would either sit upright or lie in front and stand behind.

The thorax was aspirated and about a pint of blood-coloured serum withdrawn. Relief was immediate. The animal galloped up the garden path, jumped a three-foot fence into his kennel and coiled up in a perfectly natural manner.

Two days later the symptoms had again appeared; the dog was in intense pain and it was decided to destroy him.

Post-mortem Examination.

The abdomen contained a pint of serous fluid—and very little else.

The diaphragm showed at its lowest part, centrally situated, a round hole the size of a penny. The edges of the wound were smooth, healed and contracted. Passing through this aperture and imprisoned in the thorax were the stomach, the whole of the small intestine and one half of the liver. The portion of liver incarcerated was necrotic through constriction of its vessels.

There was no food in the stomach at the time of destruction and it is difficult to imagine how food could have been swallowed. Nevertheless, the condition of the dog was quite good and there is no history of anorexia. It is quite likely that milk formed a great part of the diet. The rent in the diaphragm had undoubtedly been very extensive and had gradually healed, thus slowly cutting off the blood supply to the imprisoned organs.

The noteworthy features of this case are:—(*a*) the sudden and complete loss of hair following the accident; (*b*) the absence of apparent illness or discomfort for so long a period. Twenty-nine weeks elapsed between the date of recovery from the immediate results of the accident and the appearance of the first signs of discomfort arising from diaphragmatic hernia.

* * * * *

A SEQUEL TO CRYPTORCHID OPERATION*

W. A. MILLIGAN
Glasgow Veterinary College

Subject — A two-year-old Clydesdale colt which, as a yearling, had had the descended, near, testicle removed.

Previous History.—The following year an unsuccessful attempt was made to remove the remaining testicle. After considerable exploration the spermatic cord, of about normal size, was located when the arm was introduced nearly to the shoulder. Traction was exerted on the cord but failed to bring it any nearer the inguinal canal. Repeated attempts meeting with no better result, this procedure was abandoned.

All attempts at locating the testicle by following up the cord were of no avail owing to its distance from the point of entry.

The canal was packed with sublimate gauze and the scrotum sutured with a purse string suture. This was removed on the third day, the canal explored and everything found to be normal.

Three days later, when passing the farm, the patient was observed apparently quite healthy, moving about, and quietly cropping grass.

Immediate History.—Some three weeks later the owner observed a variable "lump" just lateral to the sheath. On occasions it attained a considerable size, but always subsided before he thought of seeking professional advice. During this period the horse manifested a disposition to colic, the attacks being variable but of a mild and transient nature, no treatment being given or advice sought. More frequently the horse was said to have rested on its haunches. There was marked tenesmus and evidence of considerable pain. These spasms were of a transitory nature and were never observed by the owner himself until just previous to his seeking professional advice.

Symptoms—When seen, the violent colicy pains had ceased. The general appearance was one of dulness, the patient standing quietly with head depressed, exhibiting an anxious expression.

Respirations were sufficiently increased to excite comment and nasal sounds were slightly louder than normal. The hind limbs were rested a little further forward than usual, producing a bracing effect of the back. The pulse was quick; frequency, 68. Temperature 103° F.

Examination of the inguinal region revealed the presence of a swelling the size of a large grape-fruit. On palpation it was fluctuating and heavily mobile. On compression it was returnable to some extent up the canal. The bowel itself could not be detected.

On rectal examination a portion of intestine could be detected entering the inguinal canal.

Diagnosis.—Ruptured inguinal hernia with commencing peritonitis. The contents of the sac were regarded as being semi-fluid alimentary matter.

Procedure.—The animal received a hypodermic injection of morphine sulph. grs. ii; was cast and chloroformed.

The scrotal area was rapidly cleaned with iodo-benzol and the completely closed wound re-opened. This was followed immediately by an abundant outpouring of pus.

On inserting a hand through the wound, bowel was soon encountered and traced up the canal, which became rapidly reduced in lumen. At the top there appeared to be complete adhesion between canal and bowel walls, cutting off communication with the peritoneal cavity. The hand was removed, scooping some of the pus out at the same time, when the withdrawn material was seen to consist now, in great part, of faecal matter.

The hand was again inserted and the canal explored to locate the rupture in the bowel wall. The mucous lining of a flat piece of bowel was detected as also was the patent bowel.

As no hope of recovery could be entertained the animal was destroyed.

Post-mortem Examination.—The abdominal

*Case in series submitted for award under the N.V.M.A. Clinical Prize Scheme for Students, 1931.

wall was opened by a circular incision about 12 inches distant from the seat of operation and the portion reflected revealed the internal inguinal ring. A small portion of fæcal matter was located there and in the surrounding area there was evidence of commencing peritonitis.

The canal was enlarged and the portion of bowel removed. It revealed a rupture in the intestine three inches long. Both lips of the wound were quite everted, making the portion of bowel slightly concave, transversely, on the peritoneal surface. The edges of the wound were convex, showing well-developed granulation tissue, indicating the existence of the rupture for a considerable time.

The testicle was now sought for and ultimately located in the region of the right kidney, being small, elongated and totally unlike a normal testicle in shape. The cord was diffuse, and intercalated and continuous with the mesentery.

Remarks.—The case is considered of interest on account of the time the rupture must have been in existence. The fæces had accumulated in the canal and sac formed by the scrotum, and then passed on into the lower portion of bowel.

Provided the adhesions between the bowel and internal ring had not given way an anus preternaturalis would probably have been formed eventually.

BRITISH MEDICAL ASSOCIATION CENTENARY MEETING

Comparative Medicine Section Programme

In our issue of April 30th we published an outline of the proceedings to take place on the occasion of the Centenary Meeting of the British Medical Association, to be held in London at the end of this month, and gave the names of the officers of the Section of Comparative Medicine.

Following is the programme of this Section:—

Wednesday, July 27th.—10 a.m., Discussion: "The Menstrual and the Œstrous Cycles." To be opened by Dr. S. Zuckerman (London), followed by Professor W. Frei (Zürich), Dr. A. S. Parkes (London), Dr. B. P. Weisner (Edinburgh), and Mr. R. Grant (Edinburgh). Papers: "The Genetics of Derangements Common to Man and Animals," Professor F. A. E. Crew (Edinburgh); "The Pregnancy Test in Mares," Mr. W. C. Miller (Edinburgh).

Thursday, July 28th.—10 a.m., Discussion: "The Ætiology of Dental Caries." To be opened by Mr. E. W. Fish (London) and Mrs. May Mellanby (Sheffield), followed by Dr. I. H. Maclean (London), Mr. W. Warwick James (London), Dr. F. W. Broderick (Bournemouth), Mr. J. G. Turner (London), Dr. E. C. Sprawson (London), and Dr. T. Hare (London). Paper: "Nerve Degenerations in Equines," Major W. M. Mitchell (Edinburgh).

Friday, July 29th.—10 a.m., Discussion: "Senescence." To be opened by Dr. G. P. Bidder (Cambridge) and Dr. B. P. Weisner (Edinburgh), followed by Professor W. R. Miles (Stamford, California), Professor H. A. Harris (London, Professor M. J. Stewart (Leeds), Major S. S. Flower (Tring), and Dr. W. Cramer (London).

Abstracts

[Contribution à l'étude radiologique de l'appariel digestif du chien. (Contribution to the Radiological Study of the Digestive Tract of the Dog.) Ollivet, Charles. (1931.) 79 pages; 11 figs.; 17 refs.; Thesis. Edit.: Vigot Freres, 23, Rue de L'école-de-Médicine, Paris.]

The thesis consists of observations on the radiological investigation of the normal digestive tract of the dog with the help of opaque meals, emulsions and enemata. The animals used in the experiments had no abnormalities of the digestive tract. The subject matter is arranged as follows:—

1. The abdominal cavity as a whole from the radiological standpoint; bony and other landmarks.
2. The general examination of the stomach and bowel with special reference to (*a*) opaque meals (solid, liquid); (*b*) position for examination; (*c*) the technique of examination.
3. Observations relating to the stomach, small intestine, cæcum and colon, each of which is considered under the headings of (*a*) Anatomy; (*b*) Special examination and its technique; (*c*) Position of patient for examination; (*d*) Radiological findings.

The Abdominal Cavity as a whole presents some recognisable features when photographed. These include the liver shadow, the bowel convolutions imperfectly suggested and occasional collections of gas in the stomach or bowel. In the former the gas appears in the cul de sac under the last three ribs on the left side. A brief survey is made of the shadow of related bony boundaries (thoracic, lumbar, sacral and anterior coccygeal vertebral and the ileal). With the spine as a radiological landmark, the authors divide the abdomen both in the ventro-dorsal and lateral photographs into three sections—an anterior part bounded by the last three thoracic vertebræ; a central area extending from the first to the sixth lumbar; a posterior segment contained within the pelvis and corresponding to the pelvic cavity of the anatomists.

The General Examination of the Stomach and Bowels. (*a*) *Opaque Meals.*—As a basis for both solid and liquid meals the authors used gélobarine, a cream-like preparation of barium sulphate, which mixes readily with solid or liquid foods. Relatively cheaper than bismuth carbonate, the barium product is tasteless and well tolerated by the dog. A solid meal of equal parts of minced meat and gélobarine or a fluid mixture of one part gélobarine with two or three parts of sweetened milk were used, depending upon the object or site of examination. The authors, using normal dogs, were enabled to withhold food for 24-48 hours, after which the opaque material

was taken voluntarily and sufficient for examination was usually ingested. In clinical patients forced feeding, preferably with liquid, becomes necessary. Sufficient is given to fill the stomach to a moderate degree, this being checked by screen examination. Taskin, to whom the writers refer, is more definite and gives the following figures:—

Weight of Dog (in kilogrammes)	100	60	30	20	12	7	4	2
Opaque meal of meat and Ba. (in grammes)	800	550	350	230	150	100	60	30

(*b*) *The Position for Examination.*—Four positions are recognised:

(1) Direct superior: patient on stomach; tube below; cassette above. Rays pass from ventral to dorsal surfaces and onto cassette.

(2) Direct inferior: patient on back; tube below; cassette above.

(3) Left lateral: patient on right side; tube below; cassette above.

(4) Right lateral: patient on left side; tube below; cassette above.

(*c*) *Technique.*—(1) Examination with the fluorescent screen is the most important aid to the examination of the bowel after opaque meals. By it the motility and passive mobility of parts of the tract may be determined. Palpation may be carried on under its control.

(2) Photographs are useful as a permanent record of phenomena seen under the screen and for the more careful examination of visceral outline.

The Stomach.—This organ may be outlined by insufflation with gas or filling with gas according to Rivières method, using tartaric acid and sodii bicarb. These methods have yielded poor results in the writer's hands and result in a distorted and indefinite image; they are only useful to throw the liver outline into relief. Accordingly they rely on barium emulsion for study of outline and Ba. meal for function.

Position.—Direct superior good. Direct inferior facilitates palpation. The transverse colon, if full of opaque material, may mask the greater curvature, but in this position can be drawn back out of the field. Lateral photographs are not of great value as the cul de sac shadow obliterates the rest.

Anatomical Relations are carefully analysed, and the position of the cardia, the pylorus and the two curvatures are defined in relation to the body surface and to the three abdominal areas discussed above. Observations are made on the effect of respiration and pregnancy. The ninth intercostal space is the usual surface level of the cardia and pylorus.

Radiological Appearances.—Like Colenson, the authors recognise two types of shadow according to shape:

(*a*) Transverse: in this type the transverse axis as seen in the direct superior or inferior positions is greater than the vertical diameter of the lateral view.

(*b*) Globular: the type in which these two dimensions are almost equal.

Each of these types is divided into two subtypes depending upon the disposition of the right or cardiac portion of the stomach. In some instances this structure is projected transversely at right angles to the long axis of the body; in other instances after proceeding transversely it turns forward in a direction parallel to the spinal column.

Figures are given which illustrate these types.

The Small Intestine. (1) The Duodenum.—Definition is difficult to obtain. The duodenum fills imperfectly with opaque material owing to small amounts which pass into it from the stomach and the rapidity of transit of material within it. Moreover, the right part of the stomach when filled with opaque material masks the anterior part of the duodenal shadow. The authors partially solve the difficulty by giving a restricted amount of gélobarine—milk mixture, so that the stomach is not distended. In the human the posterior part of the duodenum is compressed by hand, the pylorus at the same time being massaged. This enables a picture of the full duodenum to be obtained. Unfortunately, this is difficult in the dog. The writers have tried various pressure corsets unsuccessfully and conclude that the only way to visualize and condenum and overcome this difficulty of rapid transit of opaque material is to take 15 to 20 photographs at half-minute intervals after careful centreing.

Position.—Direct superior, with the patient slightly to the left side to throw the vertebral shadow to the left.

Anatomy.—The duodenum is divisable into four parts: (1) transverse superior crossing to the right lobe of liver; (2) after rounding the heptic flexure the descending part is directed towards the pelvis; (3) at the level of the sixth lumbar the duodenum turns (pelvic flexure) into the transverse inferior, and then courses forwards as the fourth or ascending part.

X-ray Appearances.—In direct superior photos the first part of the duodenum constitutes the duodenal bulb larger than the rest and disposed like an inverted heart at the level of the ninth intercostal space. This fills well, but is often overshadowed by the right side of the stomach. The hepatic flexure is always difficult to see. The descending section is rarely filled, since the opaque material passes quickly along as small pellets. The pelvic flexure at the level of L.6, is easily seen. The ascending part is only dissociated with difficulty from the rest of the small intestine. Individual variations are common. The descending duodenum may be close to, at other

times removed from, the abdominal wall. The pelvic flexure may be as far forward as L.4 or L.3. The angle of the flexure varies.

(2) The Jejunum and Ileum.—It is not possible to differentiate these from one another radiologically. Gélobarine as a liquid mixture should be given and photographs taken in the direct superior position. The lace-work of the intestine appears first behind the stomach, but soon fills all the abdominal cavity, extending to the pelvis. In lateral views the convolutions appear first behind the stomach and on the abdominal floor. They later reach the pelvis. There is always a clear space dorsal to them.

(3) The Cæcum.—Like the duodenum, this is of less importance in animals than in man. It may be perfectly outlined with opaque meals or enemata.

Position.—Direct superior or lateral. *Radiological Appearance.*—In the direct superior the cæcal shadow is in the form of a U. The bend of the U is superimposed upon the junction between L.2 and L.3 (though figure 6 shews it related to L.3-L.4—Abstr.). The arms of the U are directed to the right and backwards, terminating with uniformally rounded ends. The tip of the cæcum, directed towards the thorax as described by anatomists, is not visible. The anterior branch of the U is continued into the colon. The ileo-cæcal junction is masked. In the lateral view the cæcum is situated below the L.3-L.4 interspace a little lower than the level of a line dividing the abdominal cavity into upper and lower halves. The colon escapes above and in front, but the ileo-cæcal junction is again masked. The descending colon passes usually above, sometimes level with, quite rarely below, the cæcum.

Individual variations have not been encountered.

The Colon. — Investigated with meals or enemata. The former are to be preferred for the study of function and the latter for the study of contour:—

(*a*) *Meals.*—A mixture of gélobarine and meat is the best; it may be necessary to give three or four meals at intervals to visualise the whole colon at once in man, but in the dog photographs between 6th and 18th hour after a single meal often record complete filling of the colon. This is less likely after 12th hour; therefore, photographs between 8th and 10th are most reliable.

(*b*) *Enemata.*—For 24 hours before administration put the dog on light diet. Give evacuant enema just before commencing. Mix 1 part gélobarine with 3 parts hot water, cool to 35° C. exactly and lead into the colon by cannula connected to a flask raised to a height of 50 cm. The amounts are as follows:—

Weight of Dog.	20	15	10	5	kilogrammes
Volume of Enema ...	300	250	200	150	c.c.

Examination should be carried out in the direct superior and lateral positions. The former is the better.

Radiological Appearances.—In the direct superior views the colon is the shape of an interrogation mark. The tip, commencing at the cæcum, inclines to the right side at right angles to the long axis of the spine and then courses forward under the right costal arch at the same time inclining to the mid-line. It reaches as far as the level of 11th interspace, being here practically transverse in position, crosses the mid-line at the level of the 12th thoracic and then turns backwards along the left side. At the level of L.6 the structure inclines medially to be continued within the sacrum as the rectum. In the lateral view the ascending and transverse parts are situated at a lower level than the descending colon. The appearance is that of a dark band which detaches itself from the cæcum and passes forward to the level of 9th rib. A second irregular band then inclines upwards and backwards to pelvic entrance.

Variations are frequent not only in different individuals but in the same animal at different times.

. . . . .

A study of the rapidity of transit of ingesta along the food canal is then made, followed by observations on the movements (peristaltic, etc.) of the different parts.

Rate of Transit.—Factors influencing the speed of transit within the bowel are discussed. The author's observations with reference to solid and liquid ingesta are as follows:—

(*a*) *Solid meal consisting of equal parts of minced meat and gélobarine.*

(1) Stomach. Filling immediate; evacuation—15-16 hours.

(2) Small intestine. Filling commences ½ to 1 hour after ingestion; evacuation complete 16 hours after ingestion.

(3) Cæcum. Filling commences 2 to 3 hours after ingestion; evacuation 18 hours, but frequently small deposits persist.

(4) Colon. Filling commences 4 hours after ingestion; evacuation depends on defæcation—18 to 19 hours after ingestion very little may remain. On the other hand, opacities may persist for 24 to 48 hours.

(*b*) *Liquid meal consisting of* 1 *part gélobarine and* 3 *parts sweetened milk.*

This passes through stomach and small bowel quite rapidly.

(1) Stomach. Filling immediate; evacuation—3 hours.

(2) Small Bowel. Filling 15 minutes after ingestion: evacuation 7 to 10 hours.

(3) Cæcum. Filling commences 1 to 1½ hours after ingestion; evacuation variable; best photographs available about the fourth hour.

(4) Colon. Rectum is reached 4 to 6 hours after ingestion.

The time of transit is increased in large breeds, delay occurring chiefly in the small bowel. In addition, inexplicable variations are encountered; within a period of 15 days a dog under identical experimental conditions, may exhibit a double or treble increase in time of transit. The above figures are submitted as approximations. The authors state that exact figures would demand a much greater number of examinations.

Movements of the Intestine.—Peristaltic movements in the small intestine are not easily discerned and their record demands the use of a cinematoradiograph. The authors have been able to observe the so-called "pendular" movements. No anti-peristalsis was detected, though reference is made to Taskin, who claims to have observed anti-peristalsis in the terminal ileum.

The physiological phenomena associated with passage through the ileo-colic sphincter could not be detected on X-ray examination.

In conclusion, the authors deal with the movements of the cæcum and colon. The observations made by Cannon on the cat are reviewed and are of considerable interest. After a barium meal, in the cat, the cæcum and first part of the colon become distended with ingesta. Contractions then originate about the junction of transverse and descending colon and anti-peristaltic waves travel back to the cæcum, the ileo-colic sphincter preventing regurgitation into the ileum. A little ingesta escapes forward to be again caught up by the anti-peristaltic waves. The resulting cæcal distension now gives rise to a powerful peristaltic action which carries the bowel contents into the transverse colon.

The authors attempt to build up evidence of the same processes in the dog. They have observed the cæcum and first part of the colon fully distended with opaque material, the transverse colon empty and the descending colon containing a few streaks. The contour of the opaque mass was meantime undergoing slight modification here and there which seemed to be the reflection of bowel movements. These latter were, however, exerting no propulsive effect on the mass since the cæcum and early colon remained distended. The movements were probably therefore of an anti-peristaltic nature analogous to those found in the cat and were responsible for the cæco-colic distension. A little later boli were observed passing onwards into the transverse colon, undergoing arrest and segmentation about the end of the transverse colon and then continuing into the descending colon. The passage of material into the descending colon in the dog therefore occurs at intervals and is not the result of sustained progression. G. B. B.

[**Studies on Feline Distemper.** Hindle, E., and Findlay, G. M. *Journ. Comp. Path and Therap.* 45—Part 1. March, 1932. 11-26.]

With the object of determining the nature of feline distemper, which they state shows in many respects a remarkable similarity both to canine distemper and to human influenza, the authors have undertaken the important investigation which is the subject of these preliminary observations. Pathological and bacteriological examinations have been made of the material obtained through the co-operation of those in charge of the "lesser cats" at the Gardens of the Zoological Society, and of veterinarians and cat fanciers, the first of whom enlisted the author's attention to the subject by reference to the very fatal epidemics to which their captive feline charges were subject, while the last-named were particularly concerned about the epidemics of "Show fever" which have become such a serious problem to cat breeders in this country. In addition, experiments have been made to determine the nature of the infection, with a view to discovering more efficient methods of prevention and control.

Study of previously-recorded pathological investigations into feline distemper affords little assistance in the solution of the problem of ætiology, for the results of their experiments convince the authors that the records of various micro-organisms that have been isolated from cats dying of epidemic diseases refer in many cases to secondary invading organisms, and not to the primary cause of the disease.

The pathological changes found in wild animals and numerous domestic cats dying of feline distemper consist typically of catarrhal congestion of some part of the small intestine, ranging from a few small patches in the ileum to involvement of the whole length of the small intestine, with, exceptionally, extension into the large intestine and stomach.

The clinical symptoms are vague in the extreme and offer no certain method of clinical diagnosis; indeed, many animals have died with no definite symptoms. There may be diarrhœa and running of the eyes and nose, and fever is often present, but many animals have died showing typical pathological changes without exhibiting any significant rise in temperature.

There is no evidence that an ætiological rôle in feline distemper is played by any of the bacteria isolated, *viz.*, *Salmonella*, coliform organisms, *Streptococci*, *Pasteurella*, and para-influenza bacilli.

Experimental investigations are recounted which were undertaken with the object of affording definite experimental evidence as to the nature of the infection and as to its mode of conveyance to other animals. A serious obstacle to an enquiry of this nature is the susceptibility

of cats to infection by means of fomites, as elaborate precautions are necessary in order to eliminate the possibility of chance infections. These precautions being taken, a further mode of artificial transmission was found to be by Berkefeld filtrates of the nasal washings of cats with distemper, or by filtrates of the spleen and abdominal lymph glands, the disease being communicated to cats, and carried on in series, by intranasal instillation of such filtrates and by subcutaneous, intraperitoneal, and intracerebral inoculation. The primary cause of cat distemper then, is a filterable virus.

In view of the infectious nature of the nasopharyngeal washings, even after passing through a Berkefeld filter, it seems probable that infection is usually spread by means of infective material produced by coughing: "this would explain the way in which cats may become infected without coming in direct contact with other diseased animals."

Concerning attempts to infect other species of animals, observations at the Prosectorium of the Zoological Society of London, indicate the susceptibility of various species of cats belonging to the family Felidæ. Up to the present there seem to be no records of any of the larger members of this family, such as lions, tigers, and pumas, being affected, although young leopards are particularly susceptible. It is of particular interest to note that the authors have been unable to find any evidence to support the widespread belief that dogs are susceptible to feline distemper. Laidlaw and Dunkin (1926) found that cats are not susceptible to canine distemper, and the experiments with ferrets of Hindle and Findlay herein recorded confirm their view as to the distinctness of these two diseases. Mongooses, rabbits, guinea-pigs, and mice were also found to be insusceptible.

It was found that the virus of feline distemper could be preserved in 50 per cent. glycerine, and that the virus is attenuated or killed by drying at room temperature. The inoculation of dried virus offers a possible method of protecting kittens against infection with the disease, but "the main objection to this method would be the possibility of the attenuated virus regaining its full virulence, especially after passage. The ideal method of immunisation in feline distemper, as in canine distemper, would seem to be the injection of a dead or attenuated virus followed by live virus or by simultaneous injections of virus and serum. It is hoped that experiments will be carried out on these lines. In the meantime, the injection of immune serum, though the immunity to which it gives rise is probably only temporary, may be of use to veterinarians in the case of valuable cats immediately before their appearance at cat shows." This conclusion has been arrived at following the experimental finding that the injection of large doses of immune serum protects kittens, at least temporarily, against inoculations of virus.

W. B.

N.V.M.A. Divisional Report

DUMFRIES and GALLOWAY V.M.A.*

MEETING AT CARLISLE

The Spring Meeting of the above Division was held in the Crown and Mitre Hotel, Carlisle, on Thursday, March 31st, 1932. The President, Mr. W. T. Hewetson, occupied the chair and the following members were present:—Messrs. J. Bell, J. Cameron, W. L. McKenzie, A. J. Milligan, R. C. Robinson, G. A. Sangster, R. Simpson, A. Young and F. A. Davidson, Honorary Secretary. *Visitors*—Dr. T. W. M. Cameron, Captains T. M. Mitchell and J. R. Rider.

The Minutes, as published in the *Veterinary Record*, were taken as read.

Motion by Captain R. Simpson: As this referred to the "Free Treatment of the Sick Animals of Poor Persons," it was put back until the discussion on that subject.

Nomination of new members.—The following nominations were made: Mr. J. W. Hewson (proposed by Mr. Robinson and seconded by Mr. Milligan), and Mr. J. Reid (proposed by Mr. R. Simpson and seconded by Mr. J. Cameron).

Correspondence.—(1) From Mr. A. J. Kennedy *re* prevention of "summer" mastitis in cows and heifers. After some discussion on the subject the Secretary was instructed to thank Mr. Kennedy for his communication and suggest that he should make it the subject of a communication to the *Veterinary Record*.

(2) From Captain J. R. Rider, Secretary, North of England Division, N.V.M.A., drawing attention to the fact that Captain T. M. Mitchell had been nominated for the forthcoming election to the Council of the R.C.V.S. It was decided that, as Captain Mitchell was present, he be asked to address the meeting. At the conclusion of Captain Mitchell's speech members spoke in his support and on the proposal of Mr. R. Craig Robinson, seconded by the President, it was decided to give Captain Mitchell the Division's fullest support in the forthcoming election and the Secretary was instructed to communicate this decision to all members of the profession practising within the area of the Division.

LECTURE AND DEMONSTRATION

Dr. T. W. M. Cameron, Department of Zoology, University of Edinburgh, then presented his lecture and lantern demonstration on "Lung Worms of Domestic Animals." A synopsis of the address had been previously circulated amongst the mem-

*Received for publication June 10th.

bers. [The text of Dr. Cameron's lecture is reproduced at the commencement of this issue, together with a summary of the ensuing discussion. —Ed., *V.R.*] At the conclusion of the lecture and discussion, the President said he was sure that all of those present that day had been given a sound basis on which to approach the subject chosen by Dr. Cameron. He was afraid Parasitology had been in the past very much neglected by general practitioners and it was unfortunate that all of their members were not present that day to benefit from the comprehensive knowledge of their lecturer. Dr. Cameron's fame had preceded him and he (the President) knew that he would receive instruction which would more than repay the time and trouble taken to attend the meeting, and he had not been disappointed. Therefore it was with very great pleasure that he asked the members to accord Dr. Cameron a very hearty vote of thanks for his very instructive lecture and demonstration.

The Honorary Secretary, in supporting the President, said that it had always been his ambition to have Dr. Cameron present a paper to the Division and it was some time ago since he had received the promise to do so. Since the time when they were students together he always realised that his colleague was in the forefront as regards Veterinary Parasitology. He always kept the practitioners' difficulties in the field in view and did not leave his work at the purely scientific or theoretical stage.

On the proposal of Mr. R. Simpson, seconded by the President, a vote of thanks was accorded to Mr. Barker, Librarian, Cumberland County Council, for his kindness in arranging for the lantern demonstration, which had been given in a very satisfactory manner. The Secretary was instructed to write him to that effect.

"*The Free Treatment of the Sick Animals of Poor Persons.*"—Captain Simpson's motion, previously circulated, was put to the meeting as follows:—"That the resolution passed on November 24th, 1931, regarding the provision of Free Treatment for Sick Animals belonging to Poor Persons be rescinded." The Secretary pointed out that if this motion was carried any decisions arrived at at the Special Meeting held at Carlisle on February 4th, would also be rescinded and the position would then be as it was previous to the meeting held at Dumfries on November 24th, 1931. Amendments were proposed to the motion, but later withdrawn and the motion was agreed to. The meeting then went into Committee.

After the open meeting was resumed the decision arrived at was: "That the Honorary Secretary be instructed to communicate with the R.S.P.C.A. and the S.S.P.C.A. with a view to collaborating with them for the provision of Decentralised Schemes within the area of the Division."

Next Meeting.—It was decided that as the Summer (Social) Meeting to be held at Keswick in 1931 was cancelled owing to outbreaks of foot-and-mouth disease, the same arrangements be made for the present year.

Any other business.—The Secretary gave a report on the meeting of the Scottish Branch Executive Committee held on March 23rd, 1932, special reference being made to the report of the Sub-Committee of the Dumfries and Galloway Division *re* practitioners. Unfortunately, the Secretary had not received certain information asked for previous to both meetings and, therefore, it was not practical to discuss the question further that day.

Francis A. Davidson, *Hon. Secretary.*

In Parliament

DEBATE ON SCOTTISH AGRICULTURAL VOTE

In the House of Commons on June 28th (House in Committee of Supply), in the course of the debate on the Vote for the Department of Agriculture, Scotland, the following observations were made:—

Sir J. D. Millar: I have here a resolution from the Highland and Agricultural Society, dealing with the question of foot and mouth disease. I have no doubt the right hon. and gallant Gentleman (Sir A. Sinclair) has received a copy of it. The resolution, which calls for the prohibition of the entry of vegetables into this country from countries where foot-and-mouth disease is prevalent, is founded upon a review of the facts which, I hope, will carry conviction to the Secretary of State, because it is brought out in this statement that there was strong circumstantial evidence that the outbreak in Northern Ireland last June was traceable to a cargo of Dutch broccoli landed at Leith towards the end of May. That view was accepted by the Minister of Agriculture for Northern Ireland, but it has not been accepted by the Minister of Agriculture for Great Britain. I hope that the Secretary of State will review the Scottish interests in this matter, and that he will remember that there has been a great number of serious outbreaks of foot-and mouth disease in countries which are sending produce to this country. In such cases I think effects should be given to the representations made, and that there should be a complete prohibition of all such produce.

Mr. Burnett: I represent a town where livestock bulks largely, where a great many are dependent upon the prosperity of animal husbandry for their livelihood. Livestock producing is perhaps, next to milk products, the most important, the most successful branch of agriculture. As the hon. Member for Kincardine and West Aberdeen (Mr. Barclay-Harvey) said, in most parts of Scotland the area of cultivated land is decreasing, but in Aberdeenshire there has been an increase in recent years. We all approve of what the Secretary of State has said on the subject of agricultural research. We have benefited very much from that in the North of Scotland, from the work of the College of Agriculture. At the Rowett Institute inquiry has been made as to the effect of diet upon the nutrition of animals, and now further inquiry is being made at the

new Institute set up at Craigiebuckler into the effect of soil upon pasture. This research should be of the greatest advantage to livestock farmers.

Mr. R. W. Smith: I would like to show how the saving of £140,000 has been arrived at. There is a reduction of £3,000 or £4,000 in the money given for the improvement of livestock, though surely if there is one thing more than another we ought to do it is to improve our livestock, and yet we are reducing the grants given in respect of bulls, boars, etc. It is a tragic thing that we should be spending £3,000 more on the Macaulay Institute for soils. I have no objection to money being spent on research, but what the Minister has told us about the Macaulay Institute is that it is investigating the use of peat soils for the growing of crops, in order to bring more land into cultivation. The land already under cultivation is doing badly enough, without our starting to put people on peat soil. It is a funny thing that we should find £4,000 more for this new institute while at the same time cutting down the grants to old institutes which are doing such good work.

Mr. Neil Maclean: The Estimate for the improvement of livestock is reduced by £2,000, and yet at one time Scottish livestock was included among the finest specimens of pedigree cattle and horses one could find anywhere in the world, so much so that large numbers of prize pedigree stock in Scotland were purchased by breeders from abroad and exported to the Argentine and used in that country in order to bring about a better breed of cattle and horses. Now we find the Secretary of State for Scotland coming before the Committee with an Estimate for the reduction of the amount to be expended upon the development and improvement of one of our finest products as far as exports go.

The Secretary for State for Scotland (Major Sir Archibald Sinclair), in the course of his reply, said: I made it quite clear in my speech in introducing the Estimates that we definitely considered that a livestock policy is an important one for this country to pursue. We attach special importance to these branches of farming —livestock farming, dairying, and so forth—and I wish to make it quite clear to the Committee that that is the policy which we are pursuing.

A good deal of research has been done on questions which will greatly facilitate a forward move in the pig industry. That matter has been studied by a commission on which Scotland is represented by Sir William Haldane. In regard to the milk industry we have set up a Milk Reorganisation Commission.

A great deal of work had previously been done in Scotland in regard to such matters as research and disease, and we are increasing that work now and working towards an objective which will be directly useful in the development of the Government's policy for the dairying industry.

A type of streptococcus occurs in the joints and in the blood of patients affected with chronic articular rheumatism, according to Burbank. These streptococci can be isolated from the blood only by a special technique. A condition similar to the articular lesions in chronic rheumatism was produced in rabbits by the injection of cultures of these streptococci. If the joints are infected with these streptococci the removal of the teeth and tonsils will be of little or no value. The most effective treatment is by means of a vaccine.—*Science.*

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

DIARY OF EVENTS

July 11th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, at 4.30 p.m.

July 12th.—Meeting of the Derbyshire Division, N.V.M.A., at Derby.

July 15th.—Summer Meeting of the Eastern Counties Division, N.V.M.A., at Great Yarmouth.

July 22nd. — Summer Meeting of the Lancashire Division, N.V.M.A., at the Harper Adams Agricultural College, Newport, Shropshire.

July 29th.—Meeting of the Royal Counties Division, N.V.M.A., at the Zoological Gardens, Whipsnade.

Aug. 8th-13th.—N.V.M.A. Jubilee Congress at Folkestone.

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APPLICATIONS FOR CONGRESS FUNCTION TICKETS

In two issues insertion has been made of the form of application for tickets required for the various functions to be held in connection with the N.V.M.A. Congress at Folkestone.

It will be of great assistance to the Provisional Committee if members will fill in and return these forms **at once** to the Local Secretary, Major T. Dalling, Langley Court, Beckenham, Kent, as accommodation cannot otherwise be guaranteed.

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THE LATE DR. BERNARD BANG

We are indebted to Dr. Oluf Bang, Professor of Pathology at the Royal Veterinary High School, Copenhagen, for the excellent portrait of his supremely distinguished father which adorns this issue. The portrait was taken on the 70th birthday of the late Professor Bernard Bang, and our one regret is that we were unable to secure it in time to insert it in our last issue, which contained an account of the wonderful life and work of this great veterinary scientist.

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R.C.V.S. ANNUAL DINNER

In our next issue we shall be publishing an extended report of the above function, which was held at the Hotel Victoria on Thursday of last week, and which was rendered supremely notable in the annals of the Royal College by the presence, for the first time, of a member of the Royal Family.

The Fellows and Members of the R.C.V.S., together with a large number of distinguished guests, numbering in all nearly 150, listened with the keenest appreciation to the admirable discourse in which His Royal Highness the Duke of Gloucester gave eloquent evidence of his knowledge of and interest in the work and aims of the veterinary profession. Pleasing reference was made in subsequent speeches—also on a high plane of achievement and importance—to this hereditary concern for our well-being, which was further exemplified earlier in the evening by the gracious acceptance by His Royal Highness of the Diploma of Hon. Associate, R.C.V.S.

The President of the Royal College, Mr. G. P. Male, was most justifiably the recipient of many congratulations upon the outstanding success attendant upon the great social feature of his year of office.

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PERSONAL

Honorary Degree for Colonel Dunlop Young.—There is no more popular figure in the profession than our esteemed colleague, Lieut.-Colonel T. Dunlop Young, O.B.E., M.R.C.V.S., D.V.S.M., Veterinary Officer and Chief Veterinary Inspector to the Corporation of London, and his many friends will join with us in congratulating him upon the conferment upon him (*Honoris Causa*) of the Degree M.C.P. & S. (Cal.)—Member of the College of Physicians and Surgeons, Calcutta, India.

Colonel Young sails in the M.V. "Highland Patriot" on August 6th as the guest of the Argentinian, Uruguayan and Brazilian Governments to attend the International Refrigeration Congress at Buenos Aires and to visit all the meat works, leave of absence for these purposes having been granted him by the City Corporation.

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R.C.V.S. OBITUARY

Wilson, Edward, Johannesburg, South Africa. Graduated Dublin, December 14th, 1910; died June 6th, 1932.

. . . . .

Mr. J. F. Smith, of Halesworth, whose name appears in the list of "Existing Practitioners" registered under the Veterinary Surgeons Act, 1881, passed away at the end of last month, after a lingering illness, at his residence in Chediston Street, Halesworth. Mr. Smith, who was 79 years of age, was (says the *East Anglican Daily Times*) a well-known figure in the district, having spent nearly all his professional life there. In recent years he was veterinary inspector at local cattle markets.

Mr. Smith was a widower and leaves a grown-up family of three sons and seven daughters.

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D.V.S.M. EXAMINATION

On the results of the examination held at Edinburgh in June, the following candidates have been awarded the Diploma in Veterinary State Medicine:—Norman Percy Male; William Alfred Milligan.

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D.V.S.M. (VICT.)

At an examination for the above Diploma (D.V.S.M. [Vict.]) recently held at Manchester, the following candidates were successful:—

W. Leslie Dwerryhouse; Clifford Crompton; A. Gwyn Beynon.

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LIVERPOOL DEGREE OF B.V.Sc.

The following are the University of Liverpool School of Veterinary Science Examination Lists for June, 1932, in connection with the University Degree of B.V.Sc.:—

Final Examination, *Part I.*—Jenkins, E. D.; *Part II.*—Curtis, H.

Third Examination, *Part I.*—Baird, J. C., Tillemont-Thomason, Victoire de C. C.; *Part II.*—Baird, J. C.; *Part III.*—Baird, J. C., Jenkins, E. D.

First Examination.—*Part I.*—Brock, Doris M., Henderson, Ruth M., O'Neill, P., Setterfield, R. R.; *Part II.*—Brock, Doris M., Henderson, Ruth M., Massey, Kathleen M., Needham, A. J. E., O'Neill, P., Setterfield, R. R., Waddington, F. G.

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PROMOTION OF ARMY OFFICERS (EXAMINATION)

The results are announced of the examination (in written subjects) of officers with a view to promotion in the Regular Army and Indian Army, which was held in India and Burma last March.

Of the Regular Army candidates, three majors of the Royal Army Veterinary Corps were successful, *viz.*, Majors S. W. Marriott, O.B.E., B. J. W. Nicholas, and C. M. Stewart.

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ROYAL DICK VETERINARY COLLEGE

Prize Distribution by the Secretary of State for Scotland

The Right Hon. Sir Archibald Sinclair, Secretary of State for Scotland, in presenting the medals and prizes, on June 30th, to the students of the "Dick" College (named below), described that institution as a temple of veterinary science not merely of national but of world-wide fame. The Government not only realised the value of the great public services performed by the College, but also the immense field of activities which now lay open to its students, and in so far as the Government could, within the sadly restricted financial limits, help them to enlarge its scope, he assured them of their active sympathy. (Applause.)

First of these was the prevention of losses to farmers from disease among live stock. It was estimated that the losses from disease in live stock in Scotland alone amounted to not less than £1,000,000 a year, though indeed as regarded the diseases of sheep the remarkable achievements of an old student and professor of the College and his brilliant staff at the Animal Diseases Research Association gave promise of a substantial and immediate reduction in that figure.

The veterinary scientists of to-day were in constant and ever-growing co-operation with their brethren in the medical profession.

The list of prizewinners is as follows:—

Silver Medals

Anatomy (Junior)—W. M. Brownlie. Practical Anatomy—G. S. Beattie. Biology—S. T. Harriss. Chemistry—P. J. Fraser. Practical Chemistry—R. Stewart Macdougall Prize—S. T. Harriss. Anatomy (Senior)—A Robertson, B.Sc. Practical Anatomy—J. M. Rorrison. Physiology—A. Robertson, B.Sc. Zootechny—J. A. M'Kinnon. The Gemmell Prize—J. M. Rorrison. Materia Medica—J. S. S. Inglis, B.Sc. Hygiene—J. S. S. Ingiis, B.Sc. Pathology—J. M'P. Fraser. The M'Callum Prize—J. M'P. Fraser. Medicine—J. P. Pickering. Surgery—J. P. Pickering. Obstetrics—J. P. Pickering. Clinique—J. P. Pickering. Macfarlane (Aggregate) Medal—J. P. Pickering.

Bronze Medals

Anatomy (Junior)—H. N. Kellas. Biology—W. M. Brownlie. Chemistry—A. W. Gledhill. Practical Chemistry—W. J. M'Ilroy. Anatomy (Senior)—J. M. Rorrison. Physiology—R. M. Gambles, B.A. Practical Physiology—J. W. R. Pearce, B.A. Histology—R. M. Gambles, B.A. Zootechny—J. M. Rorrison.. Materia Medica—W. S. M'Kay. Hygiene—J. M'P. Fraser. Pathology—G. A. Durham. Medicine—W. B. Forrest. Surgery—W. B. Forrest.. Obstetrics—W. B. Forrest. Clinique—J. H. Blanchard. Parasitology—J. P. Pickering.

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Board of Governors

The following gentlemen have been appointed to represent the Veterinary Profession in Scotland on the Board of Governors of the Royal (Dick) Veterinary College for three years from July 1st, 1932:—Messrs. W. W. Peggie, F.R.C.V.S., Biggar; G. A. M. Harle, M.R.C.V.S., Coldstream; J. G. McGregor, M.R.C.V.S., Stirling.

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COMPULSORY PASTEURISATION OF MILK

"Manchester's proposal to seek powers to restrict the milk supply of the city to tuberculin-tested and pasteurised milk has been under consideration by producers in the North-Western area for several months," says the *Farmer and Stockbreeder*. "While this was isolated action it was realised that other towns might follow, and it would now appear that the movement is gaining force. The four large Scottish towns, led by Glasgow, are considering a similar course, and Medical Officers of Health in other parts of the country are leading their authorities along the same lines.

"It is evident that, in face of strenuous efforts to make the question a national one, it can no longer be regarded as a local issue."

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

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"SOME MATTERS OF INTEREST TO THE GENERAL PRACTITIONER AND THE VETERINARY INSPECTOR."

To the Editor of the Veterinary Record.

Sir,—In his paper presented to the Yorkshire Division of the National Veterinary Medical Association, reproduced in your issue of June 25th last, Mr. Hugh Begg, Sen., makes some arresting statements. Firstly, that over 50 per cent. of sudden deaths in cattle—excluding anthrax—are due to tetany, which apparently includes milk fever, hypocalcæmia, hypoglycæmia, stomach staggers, grass staggers, epilepsy, fits, etc. This may be quite true, but as this is not merely an assumption but a statement following "evidence gleaned"—considering that these animals died suddenly and unexpectedly with small likelihood of the owner or attendant being able to furnish any information as to symptoms prior to death, even if these could be considered reliable, or that the symptoms were such that the veterinary surgeon attending was unable to give an opinion and was obliged to report suspected anthrax—I should very much like to know upon what *post-mortem* findings should one be able to base a diagnosis of death from the prescribed cause or causes. Must one find an answer for oneself in the previous paragraph of the writer, which states that "The causes which operate to produce death in these negative cases stir the imagination considerably"?

Further, the impoverishment of grass land of its calcium properties has resulted, it is suggested, in a hypocalcæmia in domesticated animals—presumably a dietetic error and its consequences. Yet, previously in the paper it is stated that we must "beware of an oncoming tetany . . . and not wantonly imagine the operation of a so-called chill or dietetic error in a cow in these days of rational feeding"—while again later in the paper is the suggestion that the normal calcium content of the blood may be lowered by the feeding of highly nitrogenous foods. Of a truth there is a confusion of thought here perfectly bewildering to the ordinary mind.

The super-heated steam digester is certainly an effective way of dealing with an anthrax carcass. How far disinfectants alone are successful in dealing with contaminated fold yard manure, etc., is less certain.

The assertion that 50 per cent. of aged cows killed under the Tuberculosis Order have "suffered the pain caused by a foreign body which has escaped from the stomach" I find somewhat startling, more especially if we are to be allowed to assume that a similar percentage of aged cows not tuberculous have suffered similarly, for the reason that never yet have I diagnosed abdominal traumatism of the type indicated by Mr. Begg, having probably "wantonly imagined the operation of a dietetic error"; nor have I yet seen an abscess of the abdominal wall marking the exit of one of these foreign bodies, nor even at *post-mortem* examination have I seen traumatic "peritoneal mischief" excepting in cases where a trocar has at some time been used.

Mr. Begg certainly does "stimulate thought" and a "healthy opposition."

Yours faithfully,
J. P. Cook.

Market Weighton,
York.
June 28th, 1932.

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CALCIUM TREATMENT OF MILK FEVER

To the Editor of the Veterinary Record.

Sir,—Having successfully applied the calcium treatment of milk fever for nearly two and a half years, I am prompted by Mr. Tutt's letter in last week's *Record* to report my experiences regarding its efficacy and practical application. It is high time that the controversy over this so-called new treatment ended and that its regular adoption by every veterinary surgeon was an accomplished fact.

Let me first state definitely that if the treatment is properly carried out I can see no reason for all the sloughs and abscesses which so many practitioners seem to encounter. By this I do not imply that those who experience failure or unfortunate sequelæ are necessarily careless or inefficient, but that their technique is faulty. What else can explain the fact that in some hands calcium is a success while with others it is a failure?

It may seem incredible that I have never had a slough or abscess following injection with either calcium gluconate or dextro calcium. Some may be inclined to regard this as rather a tall yarn, but it is absolutely true, and since a substantial number of injections have been carried out cannot be attributed entirely to luck.

I have looked up entries in my day book for the years 1931-32 and find that last year I and my assistant made 164 calcium injections (practically all calcium gluconate) and this year 81 injections (26 being dextro calcium).

Regarding results, I can see no difference in the response to treatment between calcium and udder inflation, recoveries appear to be equally rapid and consistent in either case. From experience I am convinced that if calcium fails udder inflation is also hopeless and that when this occurs the case has either been wrongly diagnosed as milk fever or there is some complication. It is now nearly two years since I have inflated an udder, all milk fever cases since then (however bad) having been treated with calcium injections.

Unfortunately Mr. Tutt has not described the technique he adopts in detail, and I therefore cannot discuss all the respects in which it differs from my own. He does, however, do a lot of things which I find unnecessary, and the preparation of his injection solution, which takes me not more than five minutes, seems complicated.

Firstly, I do not use distilled water, nor do I boil it for ten minutes and thus make the solution more concentrated than it should be by evaporation. Secondly, filtering is unnecessary and in my opinion only leads to contamination, and lastly, one should only have to resort to hot fomentations "once in a blue moon"—as a matter of fact, I think the use of embrocation is better.

You will note that I use more calcium gluconate than dextro calcium, and therefore only intend to deal with the preparation of the former in this letter.

I weigh out ʒii of calcium gluconate on clean paper, pour into a sterile quart bottle and fill with ordinary boiling water straight from the kettle. There is no fear of the bottle cracking if a little care is taken in filling. Shake until all the calcium is in solution, cool to blood heat and it is ready for use. I always keep a bottle of this solution in my hot airing cupboard and it is thus ready at any hour of the day or night.

The injection is made with a converted milk-fever syringe, a large-bore hypodermic needle taking the place of the teat syphon. This is boiled before use and not removed from the steriliser until immediately before injecting. Half of the solution is injected subcutaneously into each side of the neck, the site of injection having been thoroughly cleansed with 5 per cent. carbolic acid.

Care should be taken that the injection is only just subcutaneous, otherwise it will be impossible thoroughly to disperse the swellings made by the injections. This, in my opinion, is important. Instructions should also be left for the client to massage the swellings every few hours until they disappear. Embrocation, as stated before, may be used in obstinate cases. In cold weather I rug up the neck to help absorption.

I have never used calcium intravenously and cannot see any real advantage in doing so, since I understand that a relapse is likely to follow a speedy recovery unless a subcutaneous injection is also given; moreover, one meets cases in which an intravenous injection would be anything but easy to perform.

I hope my observations will help to stimulate enthusiasm among practitioners regarding the possibilities of calcium therapy and that in time the crude and out-of-date treatment of inflating the udder will be a thing of the past. Farmers commonly carry out this latter treatment themselves, and, owing to the thoughtlessness of some practitioners, who make up their calcium on the farm, at the same time openly displaying the brand used and method of preparation, etc., it will not be surprising if farmers do us out of yet another job in the near future.

Why some members of the profession are not far-seeing enough to realise that clients are often only too eager to obtain information regarding preparations and vaccines used by us which may save them a professional fee in future, is beyond my comprehension.

Yours faithfully,
Cyril R. Golledge.

Staddlecote,
Trowbridge, Wilts.
June 27th, 1932.

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DENTAL ANÆSTHESIA IN THE DOG

To the Editor of the Veterinary Record.

Sir,—May I be allowed to reply to Mr. Edwards' further letter on the above subject?

The references which I quoted are authentic, and will be found to confirm what I have already stated. I agree with him that it is highly probable that the substance of the information is new to those readers of the *Record* who do not follow up the researches in human dentistry and apply them to our patients, where and when practicable.

I am sorry if my *modus operandi* of carrying out the supraperiosteal injection is "still obscure. I can assure Mr. Edwards that it is indeed a very simple operation, and I am rather afraid that I cannot make the method any plainer than I have already done, in writing. The needle is advanced riding on the periosteum, but *never* penetrating into it. The solution must be deposited very slowly to prevent ballooning of the tissues. In the upper jaw the muco-buccal fold is correctly exposed by drawing the mucous membrane of the lip or cheek *outward* and *downward;* in the lower jaw by drawing it *outward* and *upward*. It is far easier to demonstrate than to describe, but I shall be pleased to send Mr. Edwards illustrations and descriptions as applied to human patients, should he be unable to secure a copy of the journal to which I have already referred, and from which I have taken excerpts for purposes of description.

As regards "traversing bone"—if Mr. Edwards includes the periosteum (or the alveolar process) as bone, which acts simply as a cushion for the teeth and nerve centres, forming a cushion to save the superior or inferior maxilla from fracture—as all teeth (human or animal) on mastication make a slight movement—then he is traversing bone; but from a dental point of view, the alveolar process or periosteum is not considered as such. In human dentistry, the alveolar process, or periosteum, is often taken right away under the new practice to allow of the immediate fixture of dentures. Any or all fluids containing an isotonic solution for submucous injection hypodermically injected will penetrate the alveolar ridge.

With regard to Mr. Edwards' remarks concerning Professor Wright's communication, I would go one further. I have already alluded to Dr. Posner, D.D.S. (U.S.A.)—the man who has found the line of painless insertion of the needle. This doctor was before the American Dental Society of London, demonstrating his new discovery, and although this line is not generally used by the English dental and medical professions, yet it may be in, say, 50 years' time! I hope that the veterinary profession will start it before they do! Has Mr. Edwards ever met with a case of an

impacted tooth in the dog or other domesticated animal?

I consider that when or wherever the saliva comes in contact with any part of the mucous membrane, pathogenic bacteria are inconsistent, as the saliva may be infected from other causes.

My mode of injection is as follows: I first paint the area with tincture of aconite and iodine, or mercurochrome. I then use a wool swab, drying the area for injection if wet, and inject on the labial and lingual side of the tooth. When labial, I use a Johnson napkin split into four (for economy's sake) to dry the area for injection. I then inject into the Posner line. When injecting lingually, I insert the point of the needle, give the syringe a half turn (to stop leakage) with pressure—this anæsthetises the area of injection. I can then insert the needle to the full extent with great pressure and without breaking down tissues, or more than is necessary.

Suppuration can be due to breakage of tissues; it can arise from an area of rarefaction at the apex of the tooth which can only be located by a skiagram, or from injecting into inflamed tissues which are universal in such cases as those referred to: in other words, to a pyorrhœic cause, or local infection. This usually responds to treatment, provided there is no dry socket, by the following method: "dentalone" (Parke, Davis & Co.), or aconite and iodine (Powell & Co.)—the one being a strong astringent, the other being an obtundent.

I fail to agree that from the viewpoint of surgical handicraft, local anæsthesia is superior to general anæsthesia or narcosis. In such cases, my assistant gives a general anæsthetic, and can keep (the animal being unconscious) in dental work the site absolutely clear of blood by means of an aspirator and a suitable pack, and there is no fear of the patient gagging through tickling of the fauces. This procedure results in my being able to operate in an absolutely clear field, only taking just such teeth or bone as is necessary, and in my getting through the operation more quickly than with a local anæsthetic. The range of forceps, scalers, etc., made by Ash, for human dentistry, is by far the best for canine dentistry, and I recently showed a pair of excavators at a Society meeting which are very useful to remove tartar accumulation, particularly that between adjacent teeth.

I should like to think that this was the only instance in which we lagged behind other nations.

As regards the Animals Anæsthetics Act, I have always been guided by the nature of the operation, and the necessity of relieving or obviating pain. I must confess that, strongly as I object to a learned profession being dictated to, I should not like to see the Act repealed, as I am conscious of the fact that there are many who, to oblige a client, would acquiesce in his request not to use an anæsthetic.

In conclusion, I should like to thank Mr. Edwards, once more, for raising this interesting subject, and to assure him that my remarks are intended to be criticism of a constructive and not destructive type.

Yours faithfully,
J. F. D. Tutt.

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RE DEATH OF CAPTAIN J. W. HOPKIN

To the Editor of the Veterinary Record.

Sir,—I notice in the *Record* of May 14th, 1932 (p. 570), that Captain Hopkin "served in the Matabele and South African Wars."

As Sir Frederick Smith makes no reference to our late colleague as having served in these campaigns, I shall be glad if someone could give me particulars.

Being interested in our military pioneers, I am endeavouring to trace the names of all veterinarians who have served in the various South African campaigns.

Thanking you,
Yours faithfully,
H. H. Curson.

P.O. Onderstepoort,
University of Pretoria,
Pretoria.
June 11th, 1932.

Diseases of Animals Acts, 1894 to 1927

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th June, 1932	10	10	—	—	5	5	3	76	45
Corresponding period in 1931	14	14	—	—	5	19	4	126	63
1930	11	11	—	—	4	5	6	102	45
1929	19	21	3	91	6	18	4	147	93
Total 1st January, to 15th June, 1932	214	269	3	227	76	129	129	983	463
Corresponding period in 1931	262	280	5	515	82	148	173	937	396
1930	209	222	—	—	138	205	255	1,272	489
1929	233	264	23	1,895	135	276	324	877	474

N.V.M.A. Congress at Folkestone, August 8th-13th, 1932

OFFICIAL PROGRAMME

The following is the Official Programme of the Association's Congress, to be held at Folkestone from August 8th to August 13th:—

MONDAY, 8TH, *9.30 a.m.*—Opening of Exhibition of Surgical Instruments, Drugs, etc., by the President. (Woodward Hall.)
MONDAY, 8TH, *10 a.m.*—Opening of the Congress by His Worship the Mayor of Folkestone. (Town Hall).
MONDAY, 8TH, *11 a.m.*—Paper: "Recent Advances in Therapeutics."
MONDAY, 8TH, *Evening.*—Reception by President.
TUESDAY, 9TH, *9.30 a.m.*—Paper: "The Relation of Meat and Meat Products to Bacterial Food Poisoning in Man."
TUESDAY, 9TH, *11.30 a.m.*—Paper: "Anærobic Infections of Sheep as seen in the Romney Marsh."
TUESDAY, 9TH, *2.30 p.m.*—Demonstration of Tuberculin Testing by R. E. Glover, B.SC., M.R.C.V.S., at Longport Farm, Newington, Near Folkestone.
TUESDAY, 9TH, *8 p.m.*—Popular Lecture: "What the Veterinary Profession is doing for your Animals," by Major-General Sir John Moore, K.C.M.G., C.B., F.R.C.V.S. (Town Hall). Chair to be taken by His Worship the Mayor of Folkestone.
WEDNESDAY, 10TH, *9.30 a.m.*—Paper: "A Comparison of the Systems of Meat and Milk Inspection in this Country and Abroad.
WEDNESDAY, 10TH, *10.30 a.m.*—Excursion to Canterbury—Visit to Cathedral. Arrive back 4.30 p.m. (This has been arranged mainly for ladies).
WEDNESDAY, 10TH, *11.30 a.m.*—Paper: "The Diagnosis of Gastric and Intestinal Diseases of the Dog and Cat."
WEDNESDAY, 10TH, *2.30 p.m.*—Council Meeting, Town Hall.
WEDNESDAY, 10TH, *3.30 p.m.*—Annual General Meeting, Town Hall.
WEDNESDAY, 10TH, *7.30 p.m.*—Annual Banquet, Royal Pavilion Hotel.
THURSDAY, 11TH, *10.0 a.m.*—Official Photograph—Royal Pavilion Hotel.
THURSDAY, 11TH, *10.30 a.m.*—Demonstrations, etc. (*a*) Surgical—Professor W. M. Mitchell, M.B., CH.B., B.SC., M.R.C.V.S., Professor J. McCunn, M.R.C.S., L.R.C.P., M.R.C.V.S., and Captain F. C. Gillard, M.R.C.V.S.; (*b*) Pathological; (*c*) X-ray.
THURSDAY, 11TH, *11 a.m.*—First Annual General Meeting of Ladies' Veterinary Benevolent Guild.
THURSDAY, 11TH, *2.30 p.m.*—Tuberculin Testing, Longport Farm, Newington.
THURSDAY, 11TH, *9.0 p.m.*—Dance at the Grand Hotel in aid of Victoria Veterinary Benevolent Fund.
FRIDAY, 12TH, *9.30 a.m.*—Paper: "Clinical Examination of the Cow's Udder."
FRIDAY, 12TH, *11.30 a.m.*—Paper: "Contagious Abortion: (*a*) vaccination; (*b*) its relation to Undulant Fever."
FRIDAY, 12TH, *2.30 p.m.*—Tuberculin Testing, Longport Farm, Newington.
SATURDAY, 13TH, *9.30 a.m.*—Closing Meeting, Town Hall.

SUBJECTS FOR PAPERS

PUBLIC HEALTH SECTION

(*President*: *Arthur Gofton, Esq.*, F.R.C.V.S.)
(*Vice-President*: *Major Brennan De Vine*, M.C., F.R.C.V.S., D.V.S.M.)
(*Recording Secretary*: *P. F. Dolan, Esq.*, M.R.C.V.S., D.V.S.M.)

1.—"The Relation of Meat and Meat Products to Bacterial Food Poisoning in Man.
By R. Lovell, M.SC., M.R.C.V.S., D.V.S.M., London.
Opener: Professor J. F. Craig, M.A., M.R.C.V.S., Dublin.
2.—"A Comparison of the Systems of Meat and Milk Inspection in this Country and Abroad."
By Major D. S. Rabagliati, B.SC., F.R.C.V.S., D.V.S.M., Wakefield, and Lieut.-Colonel T. Dunlop Young, M.R.C.V.S., D.V.S.M., London.
Opener: Lieut.-Colonel J. A. Dixon, T.D., M.R.C.V.S., Leeds.

VETERINARY MEDICINE AND SURGERY SECTION

(*President*: *Professor James Macqueen*, F.R.C.V.S.)
(*Vice-President*: *Professor Geo. H. Wooldridge*, F.R.C.V.S., M.R.I.A.)
(*Recording Secretary*: *Captain O. V. Gunning* D.V.M., M.R.C.V.S.)

1.—"Recent Advances in Therapeutics."
By Arnold Spicer, F.R.C.V.S., Oxted.
Opener: Dr. J. Russell Greig, M.R.C.V.S., Edinburgh.
2.—"The Diagnosis of Gastric and Intestinal Diseases of the Dog and Cat."
By Professor J. G. Wright, F.R.C.V.S., London.
Openers: Major Frank Chambers, F.R.C.V.S., Wolverhampton; Major Hamilton Kirk, M.R.C.V.S., London.
3.—"Clinical Examination of the Cow's Udder."
By Captain R. Simpson, F.R.C.V.S., D.V.S.M., Carlisle.
Opener: Thomas Wilson, M.R.C.V.S., Nantwich.

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EXPERIMENTAL PATHOLOGY SECTION

(*President*: *Professor J. Basil Buxton*, M.A., F.R.C.V.S., D.V.H.)

(*Vice-President*: *Professor S. H. Gaiger*, F.R.C.V.S.)

(*Recording Secretary*: *Dr. W. R. Wooldridge*, M.SC., M.R.C.V.S.)

1.—"Anærobic Infections of Sheep as seen in the Romney Marsh."
By A. D. McEwen, B.SC., M.R.C.V.S., Wye.
Opener: Dr. R. F. Montgomerie, B.SC., F.R.C.V.S., Bangor.

2.—"Contagious Abortion: (*a*) vaccination; (*b*) its relation to Undulant Fever."
By Dr. W. H. Andrews, M.R.C.V.S., Weybridge.
Openers: Dr. F. C. Minett, M.R.C.V.S., London; Professor G. S. Wilson, London.

LIST OF HOTELS.

UPPER TOWN:

Adelphi, 2, *Augusta Gardens, near the Leas*, £4 4s. to £5 5s. per week, or 12s. 6d. to 15s. 6d. per day.
Avondale, 19, *Clifton Gardens*, £3 13s. 6d. to £5 5s. per week, or 10s. 6d. to 14s. 6d. per day.
Bannockburn, 27, *Castle Hill Avenue*, from 2½ guineas weekly.
Bath Hotel, *The Leas*, from 3 guineas weekly.
Belvedere, 12, *Trinity Crescent, en pension*, £4 4s. per week, or 14s. 6d. per day.
Blount's (Private), 28, *Clifton Gardens*, from £4 4s. per week.
Bouverie House, 25-26, *Bouverie Square, en pension*, 3-3½ guineas per week.
Bristol, 2-3, *The Leas*, from £4 4s. per week, or from 12s. 6d. per day.
Burlington, *The Leas*, from 7 guineas weekly
Cambridge (Private), 24, *Clifton Gardens*, from £4 4s. per week.
Casbon House, 14, *Castle Hill Avenue*, from £3 3s. weekly.
Clifton, *The Leas*, £5 15s. 6d. to £10 10s. per week, or 16s. 6d. to 30s. per day.
Comans, *Castle Hill Avenue*, from £4 4s. to £6 6s. per week, or from 13s. 6d. per day.
Carlton (Private), 18-19, *The Leas, en pension*, from 10s. 6d. to 19s. 6d. per day.
Flordon House (Private), 10, *West Terrace, en pension*, from £3 13s. 6d. per week.
Garden House, 142, *Sandgate Road, near the Leas*, from £5 15s. 6d. per week or from 16s. 6d. to 25s. per day.
Glendower (Private), 29, *Clifton Gardens*, £3 13s. 6d. to £4 14s. 6d. per week.
Grand, *West Leas* (licensed), from 25s. per day.
Gresham (Private), 18, *Clifton Crescent*, £3 3s. to £5 5s. per week.
Highcliffe (Private), 22-23, *Clifton Gardens*, from £3 3s. per week, or 10s. per day.
Holderness (Private), *Clifton Crescent*, from £3 3s. per week or 10s. 6d. per day.
Hurlingham, 18, *Clifton Gardens*, £3 3s. to £5 5s. per week.
Kildare (Private), 17, *Clifton Gardens*, £3 3s. to £5 5s. per week, or from 10s. 6d. per day.
Langhorne, *The Leas, en pension*, from £4 4s. per week.
Lincoln (Private), 20-24, *Bouverie Square, en pension*, from £3 3s. per week.
Leas (licensed), *Clifton Gardens, The Leas*, 5½ to 7½ guineas per week.
The Longford (Private), 7, *The Leas*, 4 to 5 guineas per week.
Lyndhurst, *Clifton Gardens, The Leas*, from £7 7s. per week.
Majestic (licensed), *Castle Hill Avenue*, from 17s. 6d. per day for not less than 5 days.
May-Fair (Private), 9-10, *The Leas*, from £3 13s. 6d. per week, *en pension*.
Montclair (Private), 21, *Clifton Gardens*, from £3 3s. per week.
Moore's, *The Leas*, from £3 13s. 6d. per week.
Norfolk (licensed), 10-12, *Langhorne Gardens*, 5 and 5½ guineas per week.
Queen's (licensed), *Sandgate Road*, from 15s. per day for not less than 3 days.
Rhodesia, *The Leas*, from 2½ guineas weekly.
Salisbury (Private), *Langhorne Gardens, The Leas*, £5 5s. to £7 7s. per week, or from 15s. per day.
Skelmersdale, 22-24, *The Leas*, 4 to 6 guineas per week.
St. Genny's (Private), 26, *Clifton Gardens*, from £3 13s. 6d. per week.
Torrington (Private), 14, *Bouverie Square*, from £3 3s. per week.
Trevarra (Private), 30, *Bouverie Road West, en pension*, from £3 3s. per week.
Wampach (licensed), 31-37, *Castle Hill Avenue*, from 17s. 6d. per day.
White House (Private), 5, *Clifton Gardens*, from £3 13s. 6d. per week.
Windsor House, *Langhorn Gardens*, from 3½ guineas.

Board-Residence:

"Twyford," 4, *West Terrace, The Leas*, 3-5 guineas weekly.
York House, 6, *West Terrace, The Leas*, from £3 3s. weekly.

LOWER SEA-FRONT:

Beach House, 10, *Marine Parade*, from £3 3s. per week.
Devonshire House, 8-9, *Marine Parade*, from £3 13s. 6d. per week.
Pier, 1-2, *Marine Crescent*, from 2½ guineas weekly.
Royal Pavilion (licensed), £6 6s. to £8 8s. per week, or from 18s. per day.
Victoria (Private), 13-14, *Marine Crescent*, from £3 3s. weekly.

Board-Residence:

Barrelle House, 14-15, *Marine Parade*, from 2½ guineas weekly.
Chatsworth, 4-5, *Marine Crescent*, from 6s. per day.
Crescent House, 11, *Marine Crescent*, from £3 3s. weekly.
Stoneleigh, 12, *Marine Crescent*, from 3 to 3½ guineas weekly.

Sandgate.

Royal Kent (licensed), from £6 6s. per week.

Hythe

Imperial, from 8 guineas weekly.
Sutherland House (licensed) from 3½ guineas per week.

As Folkestone is an extremely popular South Coast holiday resort, application for rooms should be made forthwith to ensure accommodation.

All the hotels mentioned above will gladly send further particulars upon request.